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THE ROMANCE OF ANIMAL LIFE



"FEW REALISE WHAT WONDERFUL BEINGS THEY ARE."

Page 24.

6

THE ROMANCE OF ANIMAL LIFE

SHORT CHAPTERS IN NATURAL HISTORY

BY THE REV. J. G. WOOD, M.A.

WITH ONE HUNDRED ILLUSTRATIONS

NEW YORK
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CONTENTS.

	PAGE
I. IN THE CHILDHOOD OF THE YEAR	19
II. BIRD STRUCTURE	37
III. BIRDS' EYES	53
IV. MIGRATION ON WINGS. SUMMER VISITORS	71
WINTER VISITORS	83
LOCUSTS	87
V. MIGRATION ON FOOT	93
VI. THE TIGER. IN ITS FREEDOM	105
CAPTIVE TIGERS	117
VII. THE LION. IN A STATE OF NATURE	127
IN CAPTIVITY	138
VIII. A FOUR-HANDED RACE. INTRODUCTION	149
THE APES	155
THE GIBBONS	167
THE BABOONS	171
THE TRUE MONKEYS	176

	PAGE
IX. ANIMAL REPUBLICS.	
THE BISON	183
ANTELOPES	192
ELEPHANTS AND LEMMINGS	198
X. ANOMALOUS ANIMALS.	
THE GIRAFFE	211
THE HIPPOPOTAMUS AND WHALES	218
THE BEAVER	228
WONDERFUL LEAPERS	235
MISCELLANEOUS ITEMS	244
XI. NATURE IN LITTLE	259
XII. THE WORLD'S PURIFIERS.	
TIGER BEETLES	273
GROUND BEETLES	283
STAG BEETLES, COCKCHAFFERS, ETC	299
VULTURES	313
XIII. THE SPARROW ON THE HOUSE-TOP	329
XIV. BY THE RIVER.	
THE KINGFISHER	349
THE HERON	361
MISCELLANEOUS	370





LIST OF ILLUSTRATIONS.

IN THE CHILDHOOD OF THE YEAR.

	PAGE
WINTER	20
WINTER RESIDENTS	21
ON THE WING	23
THE BLACKBIRD	25
LONG TAILED TIT-MICE	27
IN SEARCH OF FOOD	28
GOLD CREST	30
WRENS	31
NIGHTJAR	32
MESSENGERS OF SPRING	33
IN THE FIELDS	34

BIRD STRUCTURE.

ALBATROS	40
FRIGATE BIRD	41
PENGUINS	43
SEA BIRDS	47

BIRDS' EYES.

KESTREL HOVERING	55
FIELD MOUSE AND NEST	57
SWALLOWS ON THE WING	59
THE ROBIN	68

MIGRATION ON WINGS.

	PAGE
ARRIVAL OF THE SWALLOWS	73
MARTINS ON THE WING	75
SWALLOWS	77
NEST OF NIGHTINGALE	81
WILD DUCKS ON THE WING	84
HAUNT OF THE WILD DUCK	85
THE TEAL	86
THE LOCUST	89

MIGRATION ON FOOT.

THE REINDEER	97
SPRINGBOKS	100

THE TIGER.

THE TIGER	109
TIGER LEAPING	113
EXULTATION	116
TIGER AT LARGE	122
OUR GARDEN TIGER	124

THE LION.

THE LION	129
HENDRICK AND THE LION	131
LION WATCHING FOR PREY	135
LION AND KEEPER	141

A FOUR-HANDED RACE.

FOOT OF GORILLA	150
HANDS OF MONKEYS	153
A TRUE MONKEY	154
GORILLA	157
HEAD OF GORILLA	159
CHIMPANZEE	161
OURANG-OUTAN	163
MONKEYS	173, 179

LIST OF ILLUSTRATIONS.

11

ANIMAL REPUBLICS.

	PAGE
BISONS ON THE MARCH	187
GNUS	195
ELEPHANTS	199
A MIXED HERD	203
LEMMINGS	206
HEAD OF WALRUS	208

ANOMALOUS ANIMALS.

STAGS	<i>Frontispiece</i>
GIRAFFES	213
HIPPOPOTAMI	221
SPERM WHALE	223
NARWHALS	225
BEAVERS AT WORK	231
KANGAROOS	235
STONE-BUCKS	241
KANGAROO	243
HEAD OF RED DEER	245
IN SEPTEMBER	247
WILD ASSES	249
PRairie DOGS	253

NATURE IN LITTLE.

VOLVOX	261
ROTIFERS	263
GLASS TUBE ROTIFER	265
BRICKMAKING ROTIFER	267

THE WORLD'S PURIFIERS.

BEETLES	274, 275
TIGER BEETLE	277
SECTION OF A FEATHER	280
SCARABÆUS	290
HERCULES BEETLE	294
GOLOFA	296
BIG-HORNED BEETLE	297
COCKROACH	298
STAG BEETLES	300, 301

LIST OF ILLUSTRATIONS.

	PAGE
DEAD STAG BEETLE	303
COCKCHAFER	305
LONG-HORNED BEETLES	307
VULTURES	317
VULTURES ON THE BATTLEFIELD	321
GRIFFON VULTURE	323
AMONG THE RUINS	326

THE SPARROWS ON THE HOUSE-TOP.

ROLLER BIRD	331
EASTERN HOUSE-TOP	333

BY THE RIVER.

AMONG THE REEDS	350
THE KINGFISHER	352
KINGFISHER ON THE LOOK-OUT	355
BY THE RIVER	359
THE HERON IN HIS SOLITUDE	362
HAUNT OF THE HERON	364
HERON'S WING	367
HERON'S FLIGHT	368
WATER-HENS	371
THE COOT	375
THE REED WARBLER AND THE KINGFISHER	379





INTRODUCTION.



THE present volume needs only a few words of explanation by way of introduction.

From time to time, and for a space of nearly ten years, I have contributed a series of zoological essays to the magazines issued by Messrs. Isbister. They were written independently of each other as occasion demanded, and, being issued in different publications, have come under the notice of several distinct classes of readers. The publishers have decided to reissue these essays in book form, arranging them in such a manner that each volume shall be based upon some leading idea; that which characterises the present volume being the Romance of Animal Life.

In a certain sense all natural history, especially zoology, must be romantic when the student is not

content with mere external details, but tries to see below the surface. In the life-history of any animal, from the whale or elephant to the earth-worm, the gnat, the cockroach, or the clothes'-moth, there is a strong element of romance ; and, as if to add to their interest, the biography of every being into which the spirit of life has been breathed, is inextricably bound up with that of man.

See, for example, how absolutely dependent man is upon the earth-worm which he heedlessly treads under his feet, or cuts asunder with his spade. As the late Charles Darwin has shown us, man could not have found a place upon the earth had not the worm prepared the way for him. Last created of all beings, he could not have procured food but for the labours of the earth-worm, to which is due the whole of the soil upon which the trees and grasses find root. Is not this physical fact as romantic as any production of the novelist's brain ?

Few persons can believe, until the truth of the assertion is proved to them, that the clothes'-moth and the gnat are among man's best friends, though the one may annoy him by devouring his costliest and most cherished raiment, and the latter may cause him sleepless nights and restless days by its irritating bites. Yet, when their biographies are fully told, the most sceptical reader is forced to confess that

these detested beings are not only useful to man, but are so necessary to him, that, if they were all abolished, it is doubtful whether man, at least in the warmer parts of the world, could long retain his place in it.

Take again the love of young, and self-sacrifice on the part of the parent for the sake of the offspring.

We have the hunted elephant neglecting her own safety, which she could have secured with perfect ease, trying to guide her young one into security, placing her body between her baby and the savage hunters, and sinking at last under the spears which were being showered upon her. We have the whale losing her own life in the vain effort to save her offspring from the harpoon and the lance ; while all are familiar with the story of the white bear whose cubs had been killed, and who suffered herself to be shot while trying to drag them away. Then, as was seen a few months ago in my own garden, the black-bird will drive away a cat which had ventured too near its nest ; while the same cat will, in defence of her kittens, assault and put to ignominious flight a dog which had previously been a terror to her.

Again, how romantic is the fact that no being can stand alone, but must depend largely upon other creatures, while it, in its turn, though it be ignorant of the fact, affords a support to a multitude of sur-

rounding beings! Then there is the wonderful adaptability of the bodily structure, both external and internal, to climate, geographical position, and the fauna and flora of the locality.

Some animals, for instance, can live only in a tropical temperature, while others, not apparently differing in structure, can only maintain their health amid ice and snow, while others can thrive in either extreme. Here we find an analogy with opposite races of men. The Eskimo droops and dies even in the comparatively mild climate of England, while he could scarcely live a week in the tropics. On the other hand, the Negro of the Gaboon district becomes paralysed with cold at a temperature of sixty degrees (Fahr.), and would be frozen to death if he were transported into the Polar regions. Yet, the inhabitants of the temperate parts of Europe can endure either extreme, and the same man will enjoy perfect health within the Arctic circle or upon the equator itself.

So, although the element of romance is not brought ostentatiously forward in any of these essays, the reader will find it abundantly illustrated in all the chapters which are comprised within the present volume.

J. G. WOOD.

IN THE CHILDHOOD OF THE
YEAR.



I.

IN THE CHILDHOOD OF THE YEAR.



E judge by appearances.

A child in a moving ship is sure to think that the land is receding from him, and when the balloon rises into the air even the most experienced aeronaut can scarcely resist the feeling that he is stationary, and that the earth is sinking away from under him. So, when a young swimmer first makes his leap into the water from a height, he feels as if the water were rushing up at him, and not he descending towards the water.

Judging by appearances on a larger scale, the entire human race long believed that the world was a vast circular plane, that the sun rose daily in the east, set nightly in the west, and the day began and ended at the same hour over the entire world.

As with time so with seasons.

It is difficult for us, when contemplating the economy of nature, to bear in mind that the seasons

are spread round the world just as are the hours, and that there is not a moment in which spring, summer, autumn, and winter are not simultaneously existing in some portion of the earth's surface.

In February we in England are in the "Childhood



WINTER.

of the Year." The frosts of the winter's age may linger for a time, but as the Childhood of the Year passes into its youth the ice and snow must yield to the warmth of the spring-tide sun, and the face of the earth will be renewed. "Behold I make ALL things new," holds good with the material as well as with the spiritual earth.

To us, who are attached to this earth for so short a time, the most important renewals are those which take place annually, and are accomplished by means of the seasons. The two great phases of Life, animal and vegetable, come prominently forward, the latter



WINTER RESIDENTS.

being indirectly the means by which the former can exist. With vegetable life, however, we are not here concerned, and animal life is a subject so vast that we can only treat of one very small portion of a single department.

Let us look at the Childhood of the Year from the standpoint of the birds. These wonderful creatures are

differently constituted, according to the work for which they are made. Some are able, like ourselves, to withstand the extremes of winter's cold and summer's heat, and to find food throughout the four seasons. These birds, therefore, stay with us through the entire year, sometimes shifting their residences from one part of England to another, but never leaving the country ; some are so hardy that they do not even find it necessary to move from the locality in which they happen to come into the world, and the same individuals may be recognised as inhabiting the same limited district for many successive years. Such, for example, is our irrepressible sparrow, which often has a white feather in its wings or tail, by which the same individual can easily be recognised.

But there are many birds so constituted that they require a low temperature, and become uneasy as soon as the Childhood of the Year gives promise of youth. These birds, which are known to us as Winter Visitants, as a rule, only make their appearance on our shores towards the beginning of winter, taking their departure at the commencement of spring. Some of them remain for a few months longer for the purpose of laying their eggs and rearing their young ; but the greater number of them depart to other lands as soon as the weather becomes warm.

A third group of birds cannot exist in a cold climate, and are taught by instinct to seek our shores only when the warm weather has fairly made its influence felt. By reason, therefore, of the influence of



ON THE WING.

temperature upon the birds, and the effects of the seasons in altering the temperature of the earth's surface, the birds are enabled to spread their work over a much larger portion of the world than could be done if they were all independent of climate. We, in these islands, are especially favoured with regard to birds, and perhaps see a greater variety of them than is vouchsafed to any other country of equal size.

Situated far northwards, we can afford timely shelter to those birds which require a cold climate. Our shores being washed by the warm waters of the Gulf Stream, the temperature is high enough for those birds which, like the nightingale and the swallows, can only sustain life in a semi-tropical climate. So what with our permanent residents, and what with the summer and winter visitants, we enjoy exceptionally good opportunities of studying the many mysteries of bird-life, and trying to discover part of the work for which they are placed on the earth.

That they have some definite and necessary work is evident from the very fact of their existence. In the great scheme of this world's economy idleness has no place; and, as we see from the rock-records of former epochs, as soon as a group of animals has completed its task it becomes extinct, in order to make way for beings to whom a higher task is assigned.

But though we know that each living creature has its peculiar work, we find the greatest difficulty in ascertaining what that task may be. "The veil of Isis*" hath never been lifted by man" is as true now as when the wise words were first written. Still it is our duty to try to lift, if but a corner of that veil, and to find out the work of the birds, so that we may help them in doing it, and not hinder them, as we often do in our ignorance.

Let us now take a few examples of our best-known birds at this time of the Childhood of the Year.

* The Egyptian deity Isis was taken as representing the mystery of creation.

What have they done? What are they doing?
What are they going to do?

In the first place it must be remembered that the chief work which is done by animals is connected with their food. Sometimes it is directly connected with food, as in the case of the earth-worm, which,



THE BLACKBIRD.

by its peculiar mode of eating, has made, and continues to make, the fertile soil on which man is enabled to grow the various crops on which his life depends.

Sometimes the connection is indirect, as is the case with the mole, which incessantly burrows through the earth made by the worm and throws it on the surface, so as to afford it the influence of the sun-

beams, of the atmosphere with its many chemical elements, and of the rain. To other creatures is assigned the task of preserving the balance of animal life. In order to insure the full performance of the needed work, more agents are provided than are absolutely necessary. Lest, therefore, the world should be over-populated, other creatures are appointed which feed upon them, and so preserve the balance of animal life.

Especially is this the case with the fishes, which are produced in numbers so incalculably vast that if they all were to survive, the ocean itself would not be able to contain them. A single cod fish, for example, produces nearly seven million eggs, *i.e.* more than half as much again as the population of London. Let the reader only multiply this amount by the millions upon millions of cod fish which inhabit the seas, bearing also in mind the fact that each year would produce a regularly increasing amount of eggs, and he will at once see that unless some means existed of lessening their numbers they would exclude every other inhabitant of the sea.

In a lesser degree, a similar provision exists for preserving the balance of animal life upon land, the birds being among the chief agents. Take, for example, our permanent residents. There are the thrush, the blackbird, and the missel-thrush, sometimes called the storm-cock, because it pours forth its joyous song in the stormy days of winter, when almost every other bird, except the redbreast and the wren, is silent.

Injurious as are these birds to the fruit in autumn—they ate the whole of my cherries one year—they are of the greatest value in the winter and spring.



LONG-TAILED TITMICE.

Driven by hunger, they search every foot of the country in search of food, displaying marvellous ingenuity in discovering the snails in their hidden winter quarters. This is by no means a simple task, for not only do the snails conceal themselves in the darkest recesses, but they affix themselves to each other's shells in such a fashion that they look exactly like clods or stones, and might well deceive any other eye but that of a hungry thrush.

Our own thrushes not being sufficient to preserve the balance of animal life, they are assisted during the winter by relatives from other lands. These are the fieldfare and the redwing, which often visit our shores in vast numbers, remaining with us until they have finished their work in this country and are



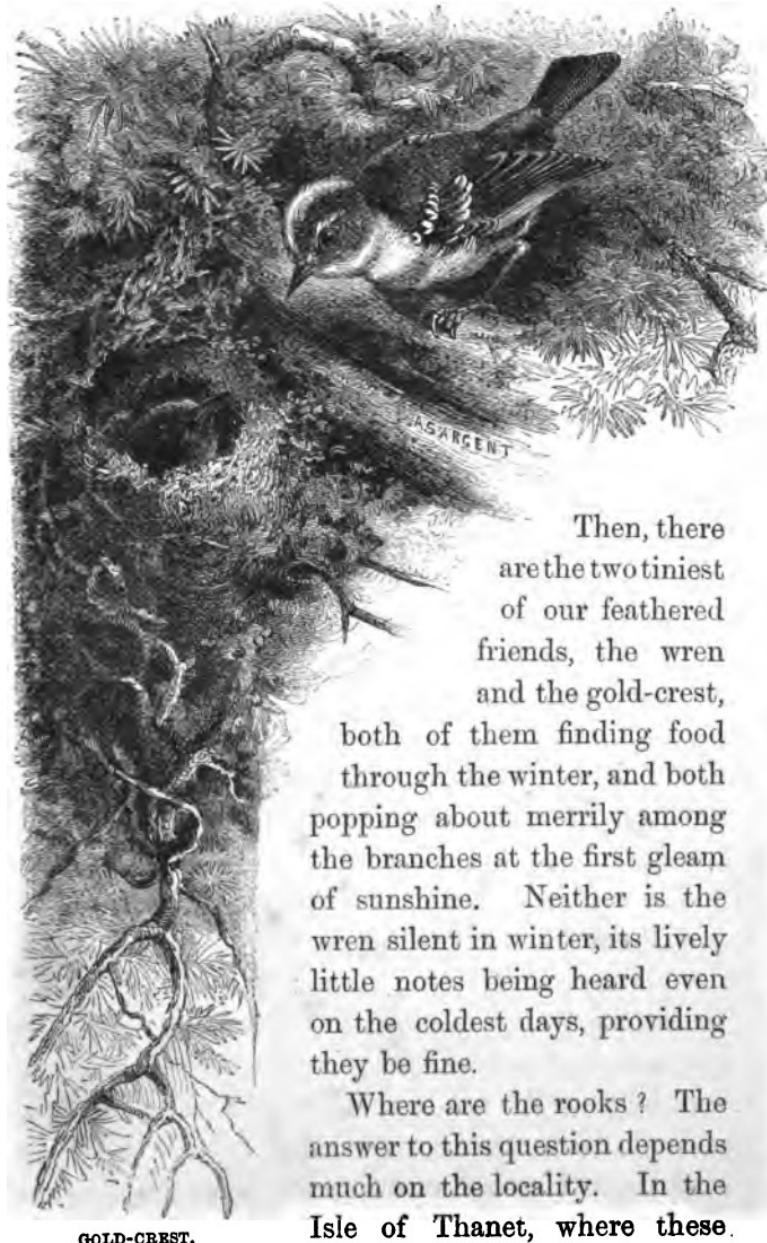
wanted elsewhere. Just now these birds are preparing to betake themselves to other lands, though some of them will linger beyond their companions, the redwing occasionally making its nest, but the fieldfare, as far as I know, invariably departing when the spring is fairly advanced.

Very wary birds are the fieldfares, especially after they have been in the country for some little time.

They know the range of a gun as well as do the rooks and crows, and to circumvent a flock of fieldfares is as difficult a task as to get within gunshot of a flock of rooks, or a pair of crows.

Then, we have the various titmice, several of which cling to man, and even through the winter may be seen hunting the stems and branches of the fruit trees in search of the eggs of the insects which, if allowed to become caterpillars, would work great harm to the trees. Encourage these little birds in every way, feeding them through the winter so as to keep them in the garden or orchard. The best way of feeding them is to tie a quantity of suet or other fat in a net and hang it to the branch of a tree by a string at least a yard in length. It is a very pretty sight to watch the little birds fly to the net, cling to it and peck away at the welcome food while it is swinging in the air. No other bird can imitate this little feathered acrobat, so that we may be sure that the food which is intended for the titmouse is not appropriated by any usurper.

The redbreast contrives to pick up a living in the winter chiefly by attaching himself to man, knowing the ploughman and gardener to be his best allies. He watches every spadeful of earth flung up by the gardener, and snatches the worms and grubs from the very edge of the spade. He follows the ploughman as assiduously as the rook or gull, and, like them, finds enough food to satisfy even his own almost insatiable hunger.



Then, there are the two tiniest of our feathered friends, the wren and the gold-crest, both of them finding food through the winter, and both popping about merrily among the branches at the first gleam of sunshine. Neither is the wren silent in winter, its lively little notes being heard even on the coldest days, providing they be fine.

Where are the rooks ? The answer to this question depends much on the locality. In the Isle of Thanet, where these

GOLD-CREST.

lines are written, they retain their places throughout the year, the sea being always within reach of an easy flight. But those rooks which inhabit inland localities are often deprived of food during a severe and prolonged frost, and are compelled to repair to the seashore in order to feed on the many marine animals which are washed up by the tide. These rooks, however, are now making their way homewards, having to look after their nests and to prepare for the coming summer.

The chaffinch and bullfinch are beginning to show themselves, and it is fortunate for them that they do not know the risks



WRENS.

which they will run at the hands of gardeners who never seem to understand that the bird which is undoubtedly injurious at one time of the year, may be more than equally useful at another.

As to the countless geese, ducks, and other water-birds which are among our winter visitants, they are beginning to become afraid of man, the lengthening days depriving them of the dark hours which form



NIGHTJAR.

one of their most important means of safety. Before March has yielded to April nearly the whole of these temporary visitors will have left our shores.

Where is the cuckoo ? Where is the nightingale ? Where are the swallows ? They are even now on their way towards us, ready to give their aid in preserving the balance of nature. The cuckoo will be with us as soon as the great hairy caterpillars have begun to be troublesome—caterpillars which no bird but the cuckoo can swallow.

Not yet is the nightingale wanted, his food not being ready for him. But he is on his way, and

long before spring has passed into summer his matchless song will be heard. Where are the swallows? Likewise on their way, and as soon as the gnats, midges, and other small flying insects are beginning to swarm, the swallow will be ready to eat them.

The nightjar, too, is preparing for its journey to our shores. It performs during the night the same task which is assigned to the swallows by day; and its long-drawn jarring cry will soon tell us that it is helping the agriculturist by eating the moths, chafers, etc., which, if allowed to increase unchecked, would seriously damage the crops.

With what wonderous care is the whole economy of Nature arranged, each creature making its appearance exactly at its appointed season, and each of them being constituted so as to work in correspondence with the sweep of the earth through its annual track of five hundred and seventy millions of miles, nothing being great or small in the eyes of the Creator!





BIRD STRUCTURE.



II.

BIRD STRUCTURE.



LET us recall certain leading principles which pervade zoology.

One is, that there is no waste in Nature, and that no new organ is ever created when its purpose can be served by the modification of an organ which already exists.

Another is, that the whole of the structure is subservient to the procuring of food; and the third is, that the material structures are always in harmony with the instinct which employs them. In the following pages I shall try to show, by a few examples, how these principles are illustrated by the structure of the bird.

The parallel may perhaps seem a strange one, but it is really the fact that the bird is in many respects the analogue of the whale. Each is, so to speak, an intruder or trespasser upon an alien element, and each is enabled to carry out its mode of life by the greater or less development of existing structures.

The whale is a true mammal, breathing atmospheric air by means of lungs, and possessing warm blood. Yet it is able practically to lead the life of a fish, which breathes by means of gills, and can keep up the temperature of the blood, even though it be constantly immersed in water scarcely above the freezing point. Yet in no point of its structure does the whale ever cease to be a true mammal.

Again, the other mammals, diverse as they may seem, all possess the same essential elements, though their identity is often hidden by external structures. If we were to show an illiterate man a whale, a bat, a kangaroo, and tell him that these three different forms were produced by variation of similar parts, he would think that we were offering an insult to his understanding. Yet, if we could strip off the skin and muscles, and remove all the other soft portions of the body, we could easily convince him by means of the bones alone how exact is the relation between them.

All, for example, possess the head, vertebræ, and ribs. All possess front limbs, though in the bat they are attenuated to the last degree, so as to act like wings ; in the whale they are flattened and shortened, so as to act like fins ; and in the kangaroo they rather serve the purpose of hands than of feet.

Then in the bat the hind legs are little more than a pair of hooked appendages, by which the animal can suspend itself when at rest. In the whale, which does not need them, the tail being the organ of pro-

pulsion, they are practically extinct, two little bones being the only remains of the pelvis and bones of the legs. But in the kangaroo we find these same bones developed to an enormous extent, so as to enable the creature to make the extraordinary leaps for which it is famous.

So it is with the birds. Some of them, like the Albatros and Frigate Bird, pass nearly all their lives on the wing. Others, such as the Ostrich, have but the veriest rudiments of wings, but are as fleet of foot as the antelope. Some, such as the Penguins, practically lead the life of fishes, and like the seals, only resort to the land or the ice for the purpose of bringing up their young. A Frigate Bird, an Ostrich, and a Penguin are quite as diverse as are the whale, the bat, and the kangaroo, and, in similar manner, neither of them loses any characteristic which belongs to the bird.

But what is a bird, and how is it to be distinguished from other vertebrate animals? The old rough-and-ready definition of "a feathered biped animal which lays eggs" will hold good as far as the present day goes, if the bird be adult.

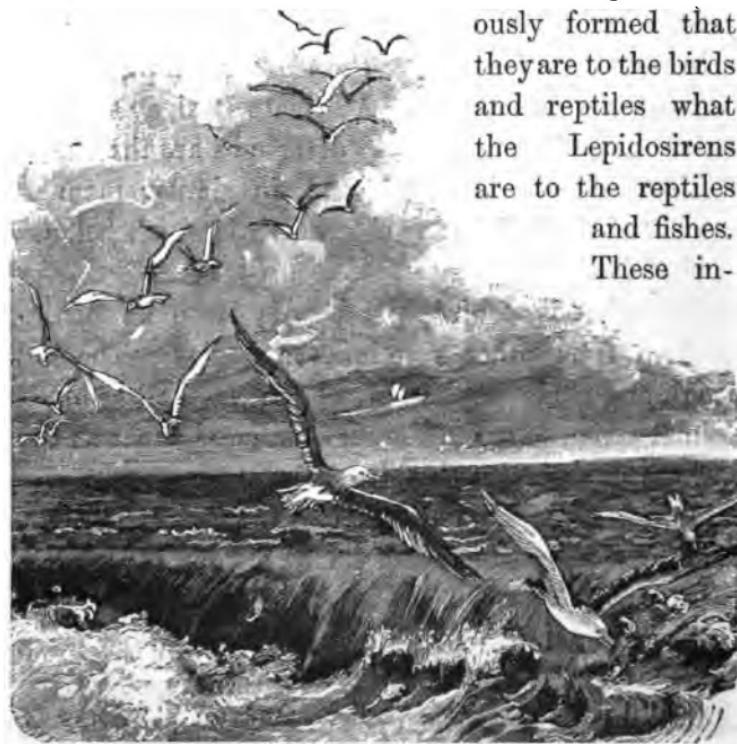
Taking animal life as it exists at the present time, it is impossible to mistake a bird for any other creature.

The mammalian whale may easily be taken for a fish, and the Lepidosiren may be considered as the connecting link between the reptiles and the fishes. The Spiders have long been erroneously ranked among

the insects. But about a bird there can be no mistake; the mere presence of feathers denotes that the creature which possesses them can be nothing but a bird.

Yet it adds an interest to bird life of the present day to know that if we could have lived in former times we should have found very great difficulty in establishing any line of demarcation between the birds and the reptiles, several of each class possessing structures which are characteristic of the other, and

some being so curiously formed that they are to the birds and reptiles what the Lepidosirens are to the reptiles and fishes.
These in-



ALBATROS.



FRIGATE BIRD.

termediate forms, however, have long been extinct, and, as far as we know, the existence of a single feather, even though it be nothing but a modified hair, is at the present time a definite proof that the possessor is a bird.

All birds have feathers ; but it would not be quite

correct to say that all birds are bipeds, as is shown by Mr. E. M. Brigham's discovery of a bird which when hatched possesses four feet. The front pair of limbs has toes, claws, and the bones belonging to a perfect foot. But soon after it is hatched the claws are shed, and the bones become consolidated and flattened until they assume the shape of the wing skeleton, and lastly they are covered with feathers, and are in no way distinguishable from an ordinary wing.

The bird in which this interesting and apparently unique metamorphosis takes place is the Cigana or Hoatzin of the Amazons (*Opisthocoma cristata*), the sole known living representative of its order. Many fossil species, however, are known, and Mr. Brigham very quaintly remarks that the Cigana's ordinary cry is a doleful sound, as if the bird were bewailing the loss of all its extinct relatives.

The habits of this strange bird are full of interest, but they are beyond the scope of this chapter.

I may here mention that some of the Penguins employ their wings as legs. These limbs are absolutely useless for flight, though they give considerable aid to the bird in its progress through the water. But the Penguin uses them with such address on land, and runs so rapidly on all fours, that it has repeatedly been mistaken for a very swift rabbit. Here, then, although the limb does not lose any of its winged characteristics, it can be used for terrestrial locomotion, just like that of the reptile, which is

below it in the scale of creation, or the mammal, which is above it.

The egg-laying test has now failed, as Mr. Caldwell has discovered that the lowest of the *mammalia*, such as the Duck-bill and the Echidna, lay eggs like birds and reptiles, although in every other respects they are mammals.

But, if we put aside these rough-and-ready definitions, and look to the internal structure, we shall find that the old Scriptural title, "the fowls of the air," still holds good.

The bird is constructed so as to hold as much air



PENGUINS.

as possible, and may be defined as an organism round a pair of lungs. Not only does the bird possess lungs of great proportional size, but those lungs pump air into a large series of air-chambers which line the interior of the thorax. Even the skeleton is subservient to respiration, the large bones of the legs and wings being hollow, and connected by certain apertures with the air-cells, which in their turn are connected with the lungs.

This structure exists in all birds, even in those which, like the Ostrich and the Penguin, are not intended for flight, but which pass their lives on the ground and in the water. How completely the Scriptural definition holds good, even in the hands of modern science, is well shown by Sir R. Owen's wonderful discovery of the gigantic Moa, or *Dinornis*. These birds are well enough known at the present day, and many species of *Dinornis* are familiar to naturalists. But as I was told the story of the discovery by Mr. Wilson (for many years manager of the Natural History department of the Crystal Palace), who was, as a boy, an eye-witness of the proceedings, I will briefly narrate it. One end of a large bone came before Professor Owen for identification. It looked like that of a reptile, and Professor Owen compared it with the corresponding bone of every large fossil saurian then known to science, and could not find that it agreed with any of them. Then, wishing to ascertain whether it really were a reptilian bone, he cut off a tiny slice, placed it under

the microscope, and lo! the "fowl of the air" stood confessed. So by applying the Scriptural definition, the largest bird that ever trod the earth was discovered by the microscope!

Now let us see how this respiratory structure is required by the different birds. Migration would be impossible but for the manner in which the whole system is permeated by air, and but for this power we could never see the Swallows, the Swans and Ducks, nor even the Nightingale. But I never thoroughly appreciated the wonderful power of the bird's respiration until I crossed the Atlantic, and noticed that Sea-gulls could accompany the vessel for some three thousand miles.

As I write these lines I am sitting on board the Cunard steamer *Catalonia*. We have been eight days out from Fastnet Point. A number of Sea-gulls started with the ship and followed her. The one-year birds, with their pretty dappled plumage, gave up the chase before very long, but a number of the old birds persisted in their task, and are now accompanying us for the sake of the food which is continually thrown overboard.

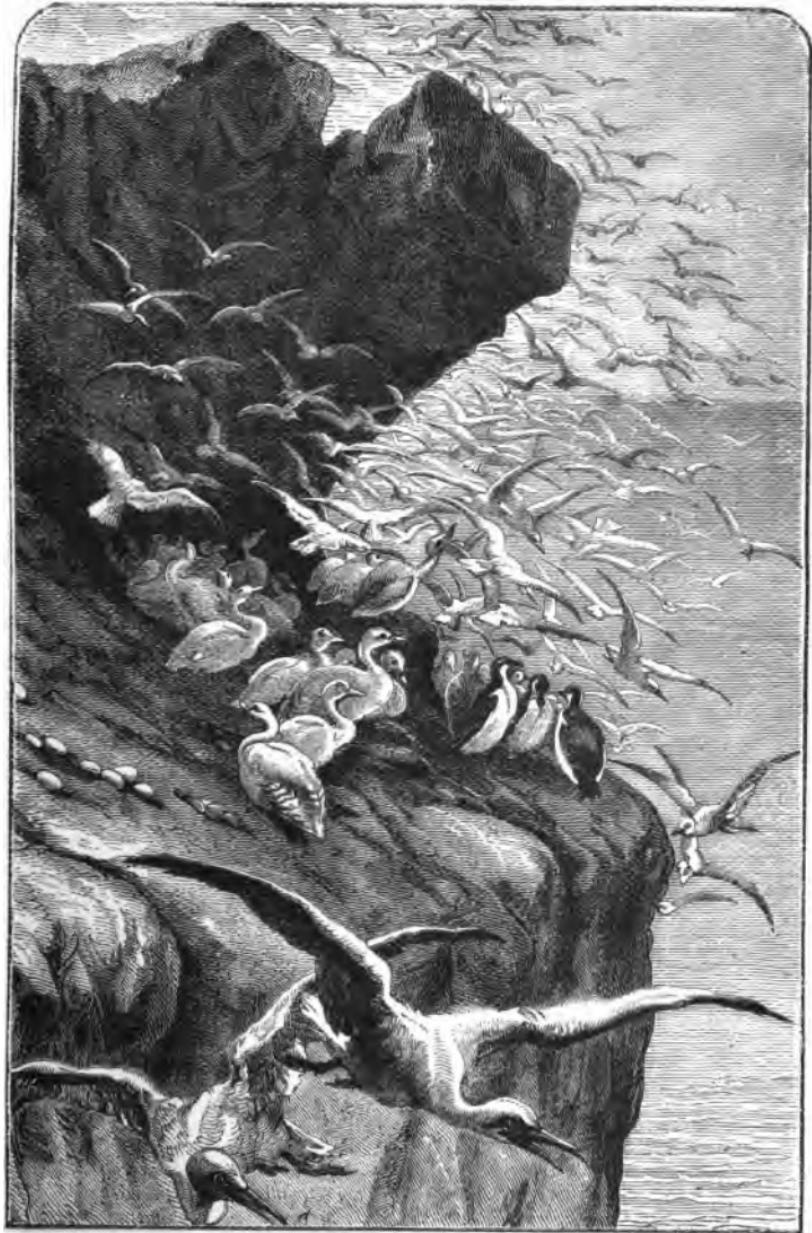
During my last two voyages the Gulls accompanied us in spite of the severe weather, and although, in consequence of violent head-winds, we were twelve days and a-half in making the passage, the Gulls were as fresh and strong on the wing as when we started, and apparently capable of continuing their flight for another three thousand miles.

Not the least noteworthy point in their wonderful journey was, that they seldom seemed to rest. I watched them very carefully on the four voyages, and never saw them settle on the water for more than a few minutes' repose to their wings.

I cannot say their "weary" wings, for the birds seem to be absolutely incapable of fatigue. They mostly remain astern of the vessel, so as to pounce upon any refuse that may be thrown overboard. But they often come alongside, and now and then one or two will shoot ahead, play round the bows, and then drop astern with their companions.

Just now there is a strong head-wind blowing. It does not seem to have the least effect upon the gulls, which float about the ship as if she were stationary, and there were a deal calm. They scarcely ever flap their wings, but wheel to one side or the other, swoop down upon a piece of bread or biscuit that has been thrown overboard, sweep up again, and resume their old point of observation. How is it done? What is the wondrous mechanism that propels the bird against a high wind, and yet scarcely requires a wave of the wing?

Another problem is this. Can the Gull live for ten or twelve days without sleep? If not, how and when does it sleep? I put this question to the Captain, who says that the Gull sleeps upon the wing, and that while sleeping it turns its head back upon its shoulder, just as a canary does when it is preparing to compose itself to sleep, and before it



SEA-BIRDS.

has finally hidden its beak among its feathers. Flight is carried on as mechanically as if it were respiration, and the bird is no more tired by flying than it would be by breathing.

Wonderful, however, as is the flight of the Seagull, it is surpassed by that of the Albatros and the Frigate Bird, in both of which creatures the body is reduced to a minimum, and the wings and feathers are extended to the maximum, so that, except during the period which is employed in bringing up the young, the bird passes its whole life in the air.

"Oh! that I had the wings of a dove; then would I flee away and be at rest," has been the aspiration of mankind in all ages. Yet the wings of a dove would be useless, unless the rest of the structure could correspond, and the respiration be in accord with the wings.

It is easy to understand why such birds should need such astonishing development of the respiratory powers, but not so easy to see why it should be required by land-birds like the Ostrich tribe and sea-birds such as the Penguins, neither of which are able even to raise themselves a single foot in the air.

The Ostriches need it in order to preserve their strength and speed, which are required to protect them from the many enemies which beset a bird which cannot fly. The chase of the African ostrich has been too often told to be repeated. But in the New World there are representatives of the same group, such as the Cassowary of Australia and the

Rhea of Southern America. In Lady Florence Dixie's interesting work, "Across Patagonia," there are several notices of the extraordinary pedestrian capacities of the latter bird, which is there called an Ostrich.

On one occasion a large hunting party composed of horsemen, both European and native, together with their dogs, all accustomed to the chase, were nearly baffled by a single Rhea, which would certainly have escaped had it not been penned into a bend of the river.

As to the Penguins, they need the air reservoirs even more than the Ostriches. In order to capture the fish, on which they live, they are obliged to dive to great distances, and consequently to remain beneath the surface for a considerable length of time. While they are diving a train of air-bubbles incessantly streams from their nostrils and rises to the surface, thus giving ocular proof of the volume of air which the bird can carry in its lungs, air-chambers, and hollow bones.

It would be easy to multiply examples, but space is limited, and I have therefore restricted myself to a few birds of diverse habits, so as to show how the same marvellous structure is necessary for them all.



BIRDS' EYES.



III.

BIRDS' EYES.



T IS a curious fact that the eyes of birds are very large in proportion to the size of the head and brain. This is not generally apparent in the living bird, because much of the eyeball is concealed by the skin and feathers. But when the skin is removed the eyes are seen to be enormous.

There is always a good reason for every structure, and we shall presently see why the organs of sight are so enormous in proportion to the brain. The fact is, that the eye of a bird has to perform far more complicated tasks than fall to the lot of human eyes.

In the first place, the bird is a winged creature, passing much of its time in the air, and flying with a speed which it is difficult to realise. Take, for example, one of the short-winged birds, such as the common sparrow, and note the rapidity of flight with which it darts past a window. If we take one of the long-winged birds, such as the swift or the kite, we

must multiply the swiftness exceedingly. It is therefore evident that if the eyes were "short-sighted," the bird would be always in danger of striking itself against branches of trees and similar objects, and so killing itself.

When telegraphic wires were first put up, numbers of birds were found lying dead beneath them, and were supposed by those who did not understand electricity to have been struck dead by an electric message which passed through their bodies while they were perching on the wires. The fact is, that they were killed by striking the wires, and not by electricity, which could not pass through the body of a perching-bird. One day, when I was in Paris, I saw a heedless sparrow fly against an overhead wire and fall to the ground in two pieces, the head having been severed as neatly as with a knife. It is worth noticing that, at the present day, birds are hardly ever killed by similar accidents, they having now learned to look out for posts and wires as well as for trees and branches.

In order, therefore, to permit a bird to espy dangerous objects in time to avoid them, its eyes must be "long-sighted." In point of fact, many birds which need to detect small objects at a great distance have eyes which are equal to our best telescopes. Such, for example, are those of the vultures, who, when searching for food, ascend to such a height in the air that they are scarcely distinguishable. From this immense elevation they can survey a vast range of country, and if an animal should be dead or even dying, it is sure

to be detected by a vulture, which instantly swoops down upon it. Besides watching the earth the vultures watch each other, so that if one of them should swoop downwards, it is immediately followed by a train of its fellows, who understand perfectly that such a descent from the skies means a meal.



KESTREL HOVERING.

A familiar instance of the telescopic eye is to be found in our common kestrel, or windhover, as it is often named. You may see it suspended high in air, remaining in almost the same spot and keeping its face to the wind, its wings playing with a peculiar quivering movement, and its head bent downwards while its

eyes are eagerly scanning the ground. So motionless is it that the late Mr. T. W. Wood, who executed many illustrations for me, once made a beautiful sketch of a kestrel on the wing by means of a telescope. He happened to possess a telescope fixed on a stand, and, seeing out of his window a kestrel hovering in the air, he brought the glass to bear on it. Finding that the bird did not move out of the focus, he fetched his drawing materials, and actually made a coloured sketch of the bird while viewing it through the telescope.

The object of the kestrel is the same as that of the vulture, namely, to look out for food from its point of vantage. Now, its food consists almost wholly of the common field-mouse, or as it ought more correctly to be called, the field-vole. The animal is so small, and its colour harmonises so well with that of the soil, that even if it were in the habit of venturing upon open ground, no human eye could detect it from such a height. But the creature very seldom does show itself on bare ground, preferring to thread its way among the grass-stalks, moving so deftly that it hardly causes a grass-blade to shake.

When I was a lad at school, I was considered as having a special aptitude for catching field-mice, and I know that even when the mouse is within a yard, it can only be detected by a trained eye. Yet, from its elevation, the kestrel will espy the mouse among the grass, and will do so with much more certainty than can be attained by any human eye. Here then is the eye acting as a telescope of singular powers.

But this is not enough. When the kestrel has detected its quarry it swoops to the ground, snatches up the mouse in its claws, and bears it away to its nest. In performing such a feat as this, long sight would be absolutely useless, as the bird is brought so close to its prey that if the eye retained its tele-



FIELD MOUSE AND NEST.

scopic powers it could no longer see the mouse. So the eye has now to change its whole character and become short-sighted. Moreover, the change between these two extremes must be made during the few seconds occupied in the downward swoop, as otherwise the bird would probably dash itself against the ground instead of seizing its prey.

Another familiar example of this rapid change may be seen any summer day.

We are all accustomed to see the swallows chasing and catching flies on the wing, but probably have not realised what is involved in this well-known action. The flies are of very small dimensions, as can be seen by opening the mouth of a swallow after it has been on the wing for some time. They are so tiny that, even when the weather is dull, and the swallows are flying so low that we can see the opening and closing of the mouth, and hear the snapping of the beak which accompanies each capture, we cannot see the flies themselves. Yet the swallows are able to see them at considerable distances, and then to adjust the focus of the eye so instantaneously that they can snap up their prey with unerring certainty.

A still more wonderful example of the power of the bird's sight is to be found in our common barn-owl, which, like the kestrel, finds its chief food in the field-mouse. In detecting the tiny prey the kestrel has at all events the advantage of daylight, while the owl hunts in the dusk, when a mouse at the distance of a foot or so would be quite invisible to human eyes. Yet the owl detects and carries off its prey with as much certainty as does the kestrel, so that its eyes must be possessed of exceptional powers.

What is the mechanism which enables the eyes of the birds to perform tasks impossible to those of man? In order to answer this question we must dissect the eye, and for this reason I would recom-



SWALLOWS ON THE WING.

mend the reader to examine for himself the eye of a fowl. I have just dissected one of these eyes, and will briefly describe the process.

Before using the knife open the eye, and you will see that beside the upper and lower eyelids there is a third and inner eyelid, made of a thin but very tough membrane, and so formed that it can be drawn completely over the eye from the inner to the outer side, and then withdrawn so that it becomes invisible. This structure is called the "nictitating," i.e. winking membrane, and is useful in washing the eyeball when dust or other foreign substances lodge in the eye. Birds have no hands wherewith to remove the annoyance, and are therefore furnished with this self-acting cleanser. A similar membrane is possessed by the horse, and is called by grooms the "haw." It is even more necessary to the bird than to the horse, as if the bird were temporarily blinded when on the wing it might dash itself against some obstacle and kill itself.

Now remove the skin from the side of the head, so as to expose the eyeball and its socket. Be very careful when dissecting off the eyelids. The next step is to remove the eye from the socket without injuring it. This is not a very easy business, as the eye is attached to the socket by six muscles, each of which must be carefully severed. A pair of small nail-scissors will perform this task better than a knife. There is no great difficulty at first, as the upper muscles are easily brought into view by pressing the

eyeball on one side. But when you come to the muscles attached to the base of the eye, sight is of no more use, and you must work by touch only.

However, we will suppose that the organ has been successfully removed, and is ready for a detailed examination.

If we compare the eye of the fowl with that of a buzzard, we shall see that they are practically identical, the chief difference being that the former is flatter than that of the latter. The reason is that poultry live almost entirely on the ground, and therefore do not need telescopic vision. But the buzzard, as I have often seen, rises to an elevation almost rivalling that of the vulture, circling on motionless wings until it looks no larger than a gnat. Hence the eye must have considerable telescopic powers in order to detect its prey so far below it. How these powers are obtained we shall now see.

In the first place, it is necessary to know the general principles on which the eyes of mammals and birds are constructed. They may be easily understood by comparing the eye with a photographer's camera, the latter being a distant imitation of the former, as indeed all human inventions more or less imitate nature. The camera consists of a box which has a lens at one end, and at the other end a sensitive plate, which receives the image thrown upon it by the lens. This is the principle of the photograph, but, to reduce it to practice, several accessories are required.

In order to absorb wandering rays of light which would blur the image, it is necessary to line the box with dull black paint, as is done in our opera-glasses, microscopes, and telescopes. Then it is necessary to shift the lens backwards or forwards, so as to make the image fall evenly on the plate, neither coming to a focus in front of it or behind it. This is called "focussing" the image.

Again, it is necessary to regulate the amount of light which is admitted into the camera, and for this purpose the operator is provided with a set of "stops" or "diaphragms," *i.e.* black plates which fit over the lens, and are pierced in the centre with a circular aperture, varying in diameter according to the amount of light to be admitted.

Now let us look at the section of the buzzard's eye, and you will see how the camera is simply an eye, with a square instead of a rounded box.

Surrounding the whole of the eyeball is the "sclerotic" membrane. The word signifies hardness or toughness, and the membrane is the analogue of the wooden box of the camera. The eye, however, requires a protection which the camera does not. Except when in actual use, the lens of the camera is protected by a cap, and even if dust should settle upon it the operator can wipe it off. The eye, however, is so constantly in use that a permanent transparent cover is needed, and such a cover is found in the "cornea," which in the birds is much more convex than in the mammals.

Then the eye has its lens, and at the back is its "retina," i.e. the expansion of the optic nerve, which enters the eye from the base. This is the analogue of the sensitive plate in the camera. The whole of the interior of the eyeball is filled with a translucent liquid called the "aqueous humour." Thus, then, it will be seen that the image which is thrown by the lens will fall upon the retina and thus be conveyed to the brain by means of the optic nerve.

Now for the necessary appliances which have already been mentioned.

If we come suddenly into a darkened room, after having been for some time in bright sunshine, we can see nothing, and feel quite blind. On the contrary, if we pass from the darkened room into sunshine we feel almost equally blinded by the light, and are obliged to shade our eyes in order to save them from severe pain. After a while, however, the eyes become accustomed to either extreme, and we can without pain endure the light of sunshine, and without difficulty can see in a darkened room.

The reason is, that the eye, like the photographer's camera, has an apparatus for regulating the amount of light which is to be admitted. The photographer is obliged to have a series of "stops," but, in lieu of the clumsy stops, the eye has the wonderful apparatus called the "iris," because it gives the colour to the eye. The "pupil" is simply a hole through which light passes to the lens, and the size of the hole is regulated by the iris, which automatically contracts

when light falls upon it, and expands in proportion as light is withdrawn.

This power of contraction and expansion is well shown in the domestic cat, whose pupils contract to a narrow slit at mid-day, and become large and round at night. So, when we are dazzled by a brilliant light, or blinded by semi-darkness, the reason is, that the iris has not had time to contract in the one case or expand in the other.

Man is not, under natural conditions, exposed to such violent contrasts of light and darkness, and therefore his iris is not very sensitive. But the bird is continually obliged to pass almost instantaneously from one extreme to the other, and therefore its iris responds immediately to the smallest variation of light. This can easily be seen by watching a parrot's eyes while talking to it. The shadow of the slightest cloud, of a person walking in front of the window, or even of a finger held up in front of the bird, causes the iris to dilate, and not for two consecutive seconds does the pupil remain of the same size.

Now for another accessory detail.

I mentioned that the interior of an optical instrument is lined with black. So is the interior of the eye, the colouring matter or "pigment" being so dark that it appears even through the tough sclerotic coat.

Lastly, we come to the means of focussing the eye so as to convert it within a few seconds from a telescope into a microscope, or *vice versa*.

On handling the eyeball of the fowl, you will find it unexpectedly hard in front, and in this respect quite unlike the uniformly soft eyeball of a mammal. This hardness is due to a number of flat bony plates, which are deposited upon the sclerotic coat, and which have a certain amount of play on each other. In poultry the plates are comparatively slight, but are strong in the predaceous birds. The eagles have them developed to a wonderful degree. The owls, too, have them of great strength, and much longer than those of the eagles, the imperfect light in which the owl flies demanding an exceptionally powerful focussing apparatus.

Their use is easily tested. Press them together while the eye is fresh, and the result is to lengthen the eyeball so as to give a greater magnifying power. The lens is also compressed, thereby increasing its convexity. If we had such an apparatus we should never be obliged to wear spectacles, and could almost dispense with microscopes or telescopes. But as we are constituted, many of us, especially after we pass middle age, are apt to have the lens rather too flat, thus throwing the focus beyond the retina. Consequently we are "long-sighted," being able to see objects at a distance, but unable to read small type or to distinguish objects near at hand.

Others can read the smallest type with ease, but cannot distinguish the features of a person at the distance of a few yards. This defect is called "short sight," the lens being too convex, and therefore bring-

ing the focus in front of the retina. For the former defect, therefore convex glasses are worn, and concave for the second.

So much for the power, and we now come to the delicacy, of focussing, a property of equal value to a bird.

Entering the back of a bird's eye, by the same aperture as that through which the optic nerve passes, is the remarkable organ termed the "pecten," *i.e.* the comb. It is composed of delicate membrane filled with blood-vessels, and, according to one of our best comparative anatomists, it automatically enlarges and contracts, in the former case acting on the vitreous humour, so as to push the lens forward, and in the latter allowing it to be retracted. In fact it may be considered as analogous to the "fine movement" used in focussing a microscope, the bony plates acting as the "rough movement."

Such, then, are some of the wonders of the bird's eye, without which all the beautiful mechanism of the body and limbs would be rendered useless.





MIGRATION ON WINGS.



IV.

MIGRATION ON WINGS.

1.—SUMMER VISITORS.



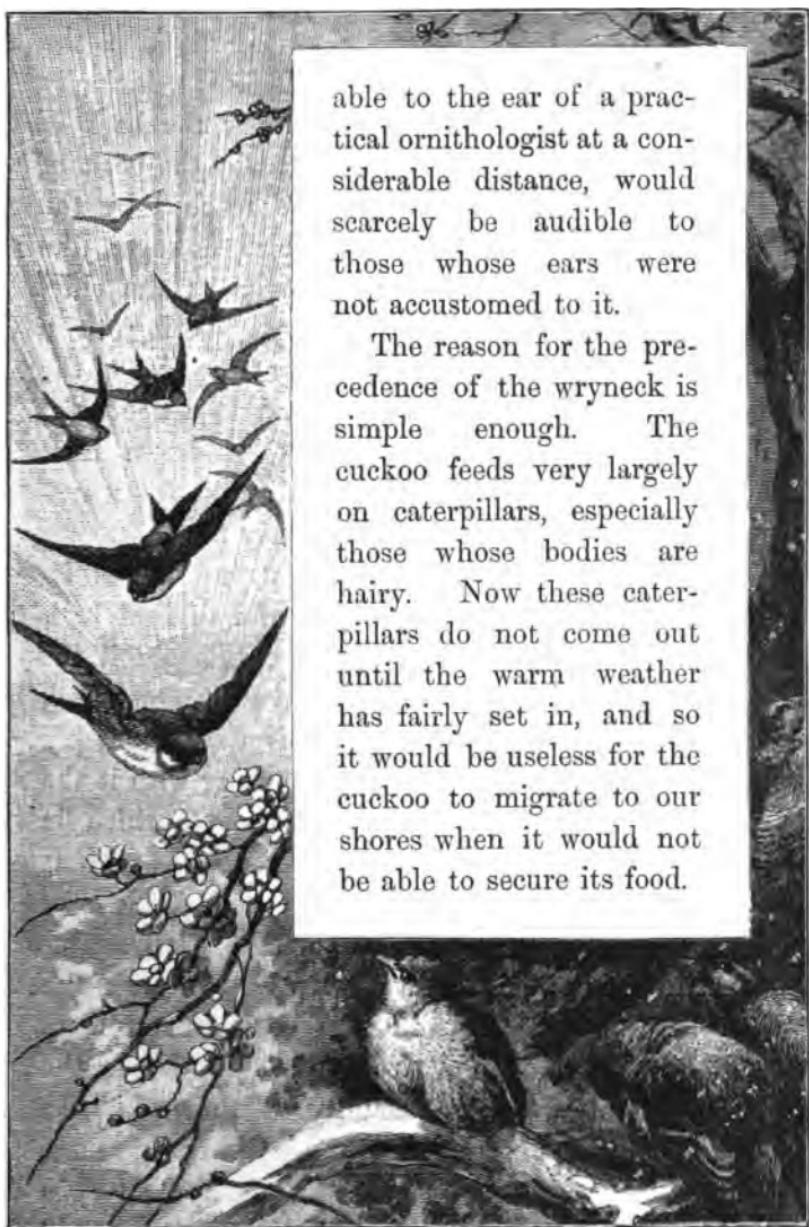
THE first consideration with all animals is how to obtain a supply of food. But in the case of a large number of both beasts and birds, the food they need is not to be obtained all the year round in the same country. The provisions made by Nature to meet this difficulty are very various. Some creatures lay up a store of food, like bees and ants. Others go to sleep for nearly the whole winter, like the dormouse. But there are others which when deprived of food by the severity of the season in one place are able to pass to other places where food still exists. Travel for this purpose is called Migration, and it may be accomplished in two ways, namely, upon the earth by means of feet, or over it by means of wings. We will now take Migration on Wings, and among those creatures which can follow

their food through the air, let us first take those which regularly visit and leave our country.

These are all birds, as, happily for us, the most terrible of the insect winged migrants, namely the locust, is unable to cross even the narrow channel which divides us from the Continent. Strangely enough, a double migration takes place among the birds, most of them arriving in this island in the spring and remaining with us until the cold weather sets in, while a second group of bird migrants reaches us in the winter, and remains here until the spring is far advanced.

I need scarcely say that as the nature of the food determines the migration, those birds which feed on living insects are taught by instinct to fly to our shores as soon as the weather is warm enough to support insect life, and that they are obliged to leave us for warmer latitudes as soon as the supply of insects becomes diminished by the approach of winter.

Among the earliest of our summer visitants is the wryneck, whose sharp, rapidly repeated, single-noted cry is welcomed by every ornithologist as the true harbinger of spring. This title is generally, but wrongly, given to the cuckoo, which is preceded by the wryneck by some ten or twelve days. The cry of the cuckoo, however, is so loud and so easily recognised, that it almost forces itself upon the notice of any one who is within half a mile of the bird. But the cry of the wryneck, though recognis-



able to the ear of a practical ornithologist at a considerable distance, would scarcely be audible to those whose ears were not accustomed to it.

The reason for the precedence of the wryneck is simple enough. The cuckoo feeds very largely on caterpillars, especially those whose bodies are hairy. Now these caterpillars do not come out until the warm weather has fairly set in, and so it would be useless for the cuckoo to migrate to our shores when it would not be able to secure its food.

The wryneck is a very different bird from the cuckoo as far as feeding goes. It lives principally on the small insects which lurk under the bark of trees, and which cannot be captured by the beak of the cuckoo. Neither can they be reached by the beak alone of the wryneck. The bird, however, like the woodpeckers, employs its tongue as the chief instrument for capturing its prey. Owing to a beautiful modification of the bones at the root of the tongue, that organ can be projected to a wonderful distance beyond the beak, and then drawn back again into the mouth. The rapidity of the movement is such that the eye can scarcely follow it.

Armed with this weapon, the wryneck uses its beak in pushing aside the pieces of half-dead bark which are found on every old tree. Should it see an insect in the crevices which have been exposed, the long, sharply pointed tongue is darted quickly forward, and is quickly retracted, bearing with it the discovered insect. As many of the insects which lie hidden after this manner are injurious to the trees, it is evident that the migration of the wryneck is of practical value to civilised man.

As to the cuckoo, which follows the wryneck, the very fact that its food consists largely of caterpillars is a proof that man is indirectly benefited by the bird's migration to this country at the very time when caterpillars are most plentiful, and can do most harm to the growing crops. As it lays its eggs in the nests of other birds, it only needs to supply

its own wants. But, it is by no means so small a bird as is generally supposed, and it is even more voracious than the hawks which it so much resembles.

When the weather is sufficiently warm to permit



MARTINS ON THE WING.

insects to take to the wing, the swallows and martins come here for the purpose of feeding upon them. The amount of flies which a swallow will capture during a single flight is really wonderful. The birds pack their prey into the lower jaw, the skin of which is very elastic and forms a sort of pouch,

which serves the same purpose as that of the pelican.

I have taken from the pouch of the swallow a solid black mass of flies, almost all of them being gnats and midges. The lump when taken out was almost as large as an ordinary nut, but as soon as it was relieved from the pressure of the bird's throat, it swelled to nearly double its former size.

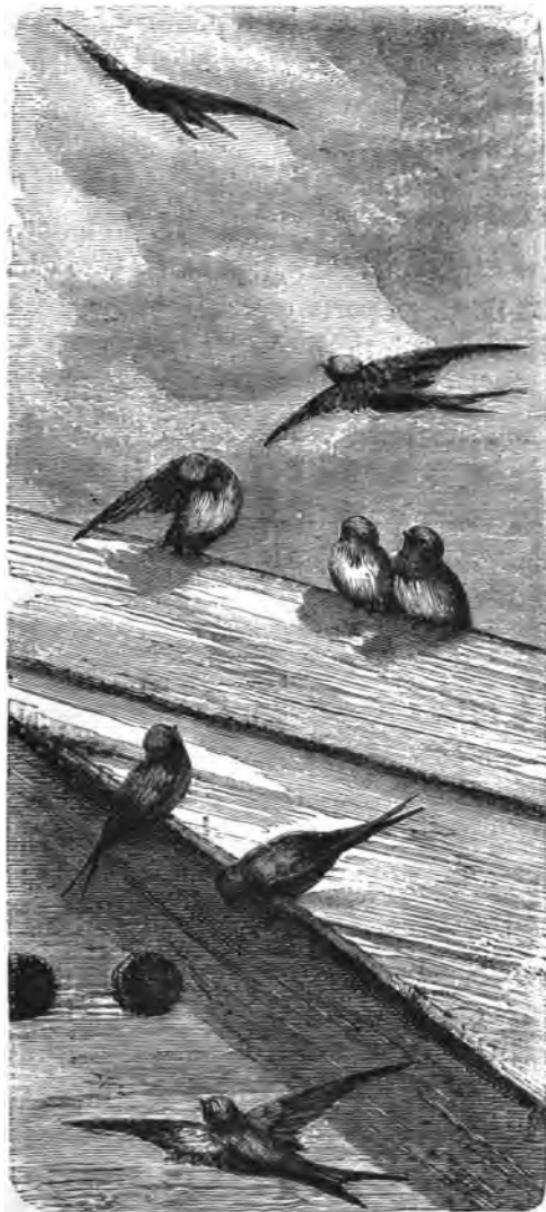
It is a very capricious bird as regards prey, sometimes taking a fancy to one kind of insect to the exclusion of all others.

Bee keepers have often been irritated by the visits of the swallows, who snap up the bees as they issue from the hive. I believe, however, that the bird restricts itself only to the harmless drones, and does not venture to attack the sting-bearing workers. Sometimes it may be seen sweeping over the rivers feeding upon the mayflies, and sometimes it will take to the beetles, especially the smaller members of the chafer tribe. I have frequently watched it upon the sea-shore, and though I cannot assert it to be a positive fact, I am sure that the birds were feeding upon the sand-hoppers.

Just before they leave this country, the swallows assemble in vast numbers every evening ; they are very noisy, and seem to be consulting as to their future proceedings, especially as they invariably fix upon one place of assemblage, and adhere to it annually. At Oxford, one of the sights of a fine autumnal afternoon is the swallow parliament, which

meets upon the dome and circular gallery of the Radcliffe Library. The birds arrange themselves in rows upon the edge of the gallery, and also upon the projecting ridges of the lead which covers the dome.

As to their track, and the mode by which they are guided upon it,



ASSEMBLING FOR CONSULTATION.

many theories have been put forward. But the course which they follow from this island has been ascertained with tolerable accuracy.

Firstly they cross the Channel to the French coasts. Then they proceed southwards through Spain, until they come to the Straits of Gibraltar, and so cross the narrow sea into Algeria. Those which come from the northern parts of the Continent seem to arrange themselves into three divisions.

One takes the same track as the English birds. The second chooses a central route, enters Italy and crosses to Corsica by means of Elba, Monte Christo, and other small islands that can serve as resting-places. From Corsica they pass through Sardinia, and reach Africa by way of Tunis. The third division traverses the whole of Italy, passes into Sicily, and thence crosses to North Central Africa.

In the "Deutsche Roman Bibliothek," it is stated that a gentleman residing at Prague caught a swallow just before migration, fastened round its neck a small white ribbon with the word "Bohemia" written upon it. In the following spring the bird came back, bearing round its neck another ribbon, with the word "Hispania" upon it. This, I believe, occurred in 1880.

In 1882 there was a paragraph in *Le Petit Nord* to the effect that a gentleman who lived at St. Omer captured, on April 26th, a swallow which had a label attached to its leg. On the label was written "Tunis, April 25th, 1882." Now the distance in a straight

line from Tunis to St. Omer is as nearly as possible eleven hundred miles, and the question was naturally raised as to the capability of the bird to traverse so great a distance in twenty-four hours. In answer to this question, *La Nature* responds that the pigeon has been known to fly from Bordeaux to Paris in seven hours. The distance between these two places is, in a direct line, three hundred miles, and therefore it would be possible for the swallow to traverse eleven hundred miles in the twenty-four hours.

But we must also remember that the hours of starting and arriving are not given, so that the swallow might have had thirty-six hours in which to perform its task, and, if it only maintained the same speed as the pigeon, would have had time to rest several times during its journey.

It is curious that the old belief about the hibernation of swallows under water still survives, and many people still assert it to be a fact. Even Gilbert White, with all his knowledge of bird life, could scarcely rid himself of the idea. The earliest account of it that I can find occurs in the "Travels of Master George Barkley," printed in 1620. While staying at Königsberg, he writes as follows: "One here in his net drew up a company and heape of swallows as big as a bushel, fastened by the legs and bills in one; which, being carried to their stoves, quickened and flew, and coming again in the cold air, dyed."

As the Swallow tribe is considered to be the type of the summer migrators, I have treated them rather

fully, and shall touch but lightly upon the other birds which visit us in the warm weather.

In the first place, we will take a bird which performs by night the task which the swallow fulfils by day. It is the Nightjar, sometimes called the Fern-Owl, but wrongly, inasmuch as it is not an owl and has nothing to do with the ferns. Still more absurdly, it is called the Goatsucker.

As to its voice, it is not easy of description, but, if once heard, never forgotten. It is something like the sound which is produced by drawing a thin, elastic strip of wood along a large-toothed comb. Only, to equal the duration of the cry, the comb would have to be at least five hundred yards long, and to imitate its character, the sound must be capable of ranging from *pp.* to *ff.*, without alteration of the note.

The flight is a curious compound of that of the swallow and the bat, and can be recognised at almost any distance. Its attitude when perching exactly reverses that of birds in general. With the exception of the Nightjar, all perching birds place themselves across the branch, with their toes clasped round it. But the Nightjar seats itself upon the branch and in the same line with it, crouching so low that the most practised eye cannot distinguish the dusky plumage of the bird from the branch on which it is sitting.

The value of this bird is almost priceless, as it feeds mostly upon the May and June chafers, whose

larvæ eat the roots of herbs, while the perfect insects devour the leaves of the trees; and upon the large night-flying moths, whose larvæ are so destructive to our vegetables, herbs, flowers, and fruit.

Then, there are the Warblers, the king of which is the Nightingale. These birds, being insect-feeders, come to us in the spring and remain until



NEST OF NIGHTINGALE.

autumn has well advanced, the exact time of arrival and departure being determined by the temperature.

Interesting as is the subject, our space is so limited, that only one more summer visitant can be noticed. This is the Quail, which has a special interest on account of its importance in early Jewish history.

It is one of our own birds, but does not come in very great numbers. Being a short-winged bird, it cannot make its way against a wind, and even when

it does find the weather favourable, it is so tired that it can be picked up by hand. It is easy, therefore, to comprehend how the Israelites were able to "gather" the quails on their arrival.

For a full elucidation of the Scriptural question, I must refer the reader to Canon Tristram's "Natural History of the Bible," published by the S. P. C. K. His account of this bird is peculiarly valuable, as he had the good fortune to be a witness of its migration, both in Africa and Palestine. One short passage, however, I must quote, as it illustrates Exodus xvi. 13, and Numbers xi. 31.

"It was 'at even' that they began to arrive, and by the morning the whole flock had settled. . . . I have myself found the ground in Algeria, in the month of April, covered with quails for an extent of many acres at daybreak, where on the preceding afternoon there had not been one. They were so fatigued that they scarcely moved till almost trodden upon ; and although hundreds were slaughtered, for two days they did not leave the district until the wind veered, and they then as suddenly ventured northwards across the sea, leaving scarcely a straggler behind. We noticed the same phenomenon on a smaller scale in Palestine, and I caught several in the Jordan valley with my hand ; one was actually crushed by my horse's feet."

The reader will notice that this short passage agrees in the minutest particulars with the Bible narrative.



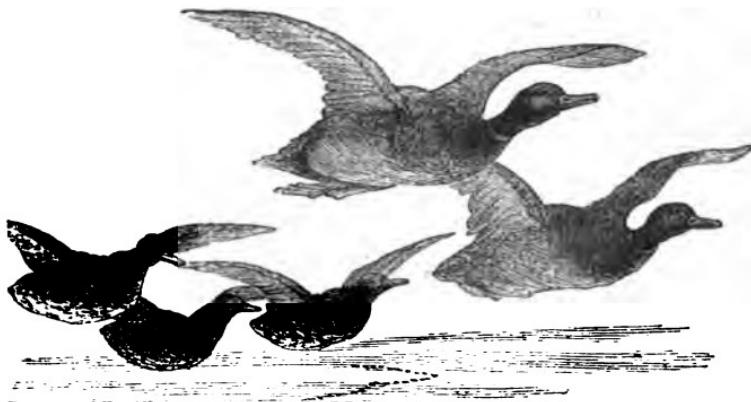
2.—WINTER VISITORS.

DOW we must glance at those birds which visit us in the winter. All the Swans, Geese, and Ducks are winter visitants, our domestic "poultry," as we sometimes call them, being simply the descendants of Mute Swans, Greylag Geese, and Wild Ducks, which have made England their home instead of a temporary residence. The Bernicle and Canada Geese became voluntary residents at Walton Hall, during the lifetime of the late Charles Waterton.

Their flight is peculiarly interesting. They always arrange themselves in two converging lines, like a gigantic V, the leading bird occupying the point. In winter time, they may be seen approaching nearly all our marshy lands, that locality with which I am most familiar being the large tract of waste land between the estuaries of the Thames and Medway. It is intersected by innumerable creeks, liable to be

overflowed whenever an exceptionally high tide occurs, and is consequently useless for tillage. But it produces an inexhaustible supply of food for the winter migrants, and so is one of the instruments by which meat is given to all flesh.

The most common of these winter migrants is the Dunlin (*Tringa cinclus*). I give its scientific title because it is plentiful on nearly all our coasts, and in



WILD DUCKS ON THE WING.

each place seems to have a different name. On the Medway Creeks it is known as Ox-bird, in many places it is called the Stint, in others the Purre, while the name of Sea Snipe is mostly given to it by inland dealers, who sometimes palm it off as a true snipe.

The Medway Creeks are visited by incalculable myriads of these birds. In the dark winter evenings, if any one with observant eyes and ears will allow



HAUNT OF THE WILD DUCK.

himself to drift through the mesh of muddy-banked creeks and "nesses," especially if the moon be shining, he will hear wonderful sounds and see a wonderful sight.

The presence of the Dunlins will be announced by their loud and incessant chatter, for they are exceeding vociferous when they feed, and the clamour of their countless voices is unlike any other sound in the world. It is impossible to see them while they are feeding, because their dark grey backs harmonize exactly with the colour of the mud on which they are standing. But let them be startled, and the sight which they present will be as strange as the sounds which they utter.

With a roar of rushing wings, like the whirlwind, the whole flock rises in the air. For a moment they are all confusion, but in a few seconds they fall into

order like a well-drilled army. They wheel round and round, forming squares, circles, and all kinds of figures with marvellous precision. At one moment, their dark backs are turned towards the spectator, and they look like a black cloud. Next moment, they all turn the white under surface of the body to him, and the dark cloud suddenly changes to silvery whiteness, reminding him of Milton's celebrated image,

“Was I deceived, or did a sable cloud
Turn forth her silver lining on the night?”





3.—THE LOCUST.



HE acknowledged type of the migrating insects is the Locust. There are many species of Locusts, but as their habits are identical, we may use the word as applicable to all the species.

Both in the Old and the New Testaments the Locust is mentioned, and the researches of modern travellers corroborate in the minutest particulars the Scriptural narrative. What manner of Locust swarm that was which was brought into Egypt, our minds can scarcely conceive. It is said in Ex. x. 14 that "before them there were no such locusts, neither after them shall be such." Bearing these words in our minds, let us see what they are at the present day.

A swarm of these insects stopped the advance of a Russian army! They filled the air and blinded both officers and men, so that the former could give no orders, and even if they had done so, the men

could not have obeyed them. The horses would not face them, and the insects lay on the ground many inches thick. Every man and horse in the army was incrusted with the insects, and their clothing was literally eaten off the men as they stood helpless and blinded. The railways were useless, as the Locusts covered the rails, and the oil which exuded from their bodies when crushed prevented the driving-wheel from "biting."

After they had settled, whole regiments were detached for the purpose of trampling them to death. Trenches were dug across their path and filled with burning coals, but the crowding swarms actually smothered the fire, so vast were their numbers.

Even in a little island like Cyprus, in 1882 one-fifth of the entire revenue was spent in destroying the Locusts and especially their eggs. When these eggs are laid, they are enclosed in a horny envelope called a "pod," each pod containing thirty-five eggs.

In seven months, one thousand three hundred and thirty *tons* of pods were destroyed. Now, a single ton of pods contains sixty million eggs, and yet, in spite of this almost incredible destruction, the Locusts continued for some years to make head against their destroyers. Perseverance however had its reward, and thanks to British pluck and enterprise, the harvests of Cyprus are for the present secure against this pest.

The Arabs say that the dark mottlings upon the

wings of the Locust are ancient Arabic, and that their signification is as follows : " We are the army



THE LOCUST.

of the great God. Each of us lays ninety-nine eggs. If we laid the hundredth, we should destroy the world."

Not long ago, I saw a letter from a gentleman over whose property a Locust swarm had passed. He said that in the morning his garden was a Paradise. In the afternoon it was all blackened and withered as if a fire had swept over it. Unconsciously, he used the very same image which the prophet Joel employed some two thousand six hundred years ago. "A fire devoureth before them; and behind them a fire burneth; the land is as the garden of Eden before them, and behind them a desolate wilderness."

Wide-winged as they are, the Locusts are very feeble in the air. Not only are they incapable of flying against the wind, but they cannot direct their course. All that they can do is to raise themselves into the air, and allow themselves to drift with the wind. See Ps. cix. 23, "I am gone like the shadow when it declineth: I am tossed up and down as the Locust."

So, we find that in the great Locust plague the insects were first blown by an east wind into Egypt, drifting between the Mediterranean and the northern parts of the Red Sea. When once in Egypt, they spread themselves southwards all over the land of Egypt. Then in order to remove them, a strong west wind was sent, which necessarily blew them into the Red Sea, where they were drowned.

In Palestine and other countries, although the Locust devours the crops, it is not altogether an unmixed plague, inasmuch as it affords food to

thousands. The Locusts are gathered together in bags, dried over the fire, their heads, wings, and legs winnowed away, and the bodies ground into a sort of meal, which can be kept for almost any length of time. When eaten, honey is mixed with the locust meal, thus illustrating the habitual food of St. John the Baptist. Canon Tristram tried this food and found it very palatable.

There is much more to be said about the Locust, but our waning space compels me to omit much which I should like to narrate. One episode in the history of the Locust must not be altogether passed over.

Just below the division of the Nile into its many mouths, and on the only road which led from Palestine into Egypt, was the city of On, *i.e.* the Sun, called afterwards by the Greeks Heliopolis, which is only a Greek rendering of the Egyptian word. It was the central educational university of civilisation, and its chief glory was the vast temple of On. In front of this temple were seven obelisks, bearing records of the Pharaohs who dedicated them. One of them was set up three thousand five hundred years ago by Thothmes III., and bears records of Rameses the Great, who is known to have been the chief oppressor of the Israelites, whose portrait and pictured deeds may be seen in the Crystal Palace, and of Manephtah, who is now known to be the Pharaoh of the Exodus.

When Abraham visited Egypt, his eyes rested on

this obelisk. So did those of Jacob ; while Joseph lived at On and married a daughter of the high-priest. I may mention that in the British Museum there is the embalmed body of one of the high-priests of On. Moses passed the whole of his early life at On, and at the time of the Exodus, the obelisk and its inscribed history must have been familiar to him from childhood. When the great plague of Locusts was brought upon Egypt, the insects passed over On, and in accordance with their habits of settling upon any upright object, this obelisk was covered with the insects.

When the seat of the Egyptian Government was transferred to Alexandria, Cleopatra removed the obelisk to that city, some twenty years before the birth of Christ. Thence it was brought in 1878 and set up on the Thames Embankment, thus exchanging the Nile and the capital of Egypt for the Thames and the capital of England. It will always be a matter of thankfulness to me that I had the privilege of seeing it placed on its present site on September 12, 1878.

As it settled into its place, the idea flashed across my mind that three thousand five hundred years had elapsed since it was first erected at On by one of the Pharaohs, and that upon its surface had rested a portion of that Locust swarm which was one of the agents that gave freedom to the people of Israel.

MIGRATION ON FOOT.



V.

MIGRATION ON FOOT.

LET us now take migration on foot. I put aside man, because his migrations (and we English are the most migratory race on the earth) are the result of reason and not of instinct. Man migrates for a definite purpose. He knows beforehand the object of his travel, and if he should prefer staying in one country he can do so. But we have not now to deal with human reason, but with animal instinct, which is in fact Divine wisdom brought into visible action without the exercise of free will on the part of the agent.

In many cases Migration has a strong influence on man. To uncivilised man it is mostly an unmixed benefit, as he lives upon the migrators. But, to civilised man, it is almost invariably an unmixed evil, as the migrators destroy the crops which he is cultivating in order to supply food for the coming

year. We shall see examples of both these influences.

As might naturally be expected, food is more apt to fail towards the poles than in the temperate zones, and so we find many examples of Migration in Northern Europe. One of them has the curious result that it involves the migration of man. I allude to the annual migration of the vast herds of Reindeer possessed by the Lapps. Forced by instinct, the Reindeers are obliged to migrate in search of food, and unless their owners wish to lose all their property, they must needs accompany the deer.

Now, to the Lapp, the Reindeer is what cows are to the Kaffir, or land and funded property to us. A Lapp of moderate wealth must possess at least a thousand Reindeer. Half that number are required to make a man recognised as one of the well-to-do middle class, while those who only have forty or fifty are nothing but servants, who are forced to mingle their deer with those of their masters.

From these details the reader can form some idea of the vast herds of tame Reindeer possessed by the Lapps alone. The annual incursion of these herds into more civilised countries can at the best be considered only a nuisance, and as the herds increase in numbers year by year their migration becomes an intolerable pest.

For example, the *Globe* newspaper lately made the following remarks :—

“ Every year, Tromsoe is the meeting-point of up-

THE REINDEER.



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wards of a hundred thousand reindeer, the property of the nomads, who follow them from Sweden. The herd is rather 'nice' in the selection of pasturage, and the absence of everything save a mere superficial control gives it the most complete freedom of choice.

"Wandering about at their own sweet will, the Reindeer do damage indiscriminately in meadow, ploughed land, and forest. The farmer may protest, but he is powerless to prevent the destruction of his young wood or the trampling down of his crops.

"If he appeals to the authorities he is baffled by the practical impossibility of fixing responsibility for damage upon the right owner. Only the Lapps know the offender, and a verdict with damages often enough serves no other purpose than that of bringing Scandinavian justice into ridicule, for, before it can be carried into effect, the defendant has gone on another of his annual migrations."

This pest has at last reached such dimensions that special laws have been recently made to meet it. Northern Norway and Sweden have therefore been divided into districts, and if damage be done, and the owners of the offending animals not be given up, the entire district has to make good the damage, each family having to pay in proportion to the number of Reindeer which they own.

Now we will turn from cold to heat, and imagine ourselves in South Africa. From the migrants of that country we will take the Springbok as our example.

Many travellers in that country have mentioned the “trek-bokken,” as the Boers call these pilgrimages, but none have painted them more vividly than the late Captain Gordon Cumming, whose description



I have had the pleasure of hearing as well as seeing.

One morning, as he had been

lying awake in his waggon for some two hours before daybreak, he had heard the continual grunting of male Springboks, but took no particular notice of the sound.

“On my rising, when it was clear, and looking about me, I beheld the ground to the northward of

SPRINGBOKS.

my camp actually covered with a dense living mass of Springboks, marching steadily and slowly along, extending from an opening in a long range of hills on the west, through which they continued pouring like the flood of some great river, to a ridge about half a mile to the east, over which they disappeared. The breadth of the ground which they covered might have been somewhere about half a mile.

"I stood upon the fore-chest of my waggon for nearly two hours, lost in wonder at the novel and beautiful scene which was passing before me; and had some difficulty in convincing myself that it was a reality which I beheld, and not the wild and exaggerated picture of a hunter's dream. During this time, their vast legions continued streaming through the neck in the hills, in one unbroken compact phalanx."

It has sometimes happened that a flock of sheep has strayed into the line of march. In such cases the flock has been overlapped, enveloped in the Springbok army, and forced to join in the march. A most astonishing example of the united power of the Springbok was witnessed by a well-known hunter.

Just as the lemming host are attended by the birds and beasts of prey of their own country, so it is with the Springbok. These parasites do not attack the main body, but watch for stragglers and pounce upon them. During the passage of one of these Springbok armies a lion was seen in the midst of the antelopes, forced to take unwilling part in the march.

He had evidently miscalculated his leap and sprung too far, alighting upon the main body. Those upon whom he alighted must have recoiled sufficiently to allow him to reach the ground, and then the pressure from both flanks and the rear prevented him from escaping from his strange captivity.

As to water, they do not require it, many of these South African antelopes possessing the singular property of being able to exist for months together without drinking. Dr. Livingstone has offered a very remarkable theory on this subject, but our limited space will not permit me to cite it. In a later chapter I shall give some further particulars of these and other migrants on foot.



THE TIGER.



VI.

THE TIGER.

1.—IN ITS FREEDOM.



ESTRICTED to Southern Asia, the Tiger is brought into much closer contact with civilisation than is the lion of Africa; and in consequence, "man-eating" tigers are far more common than lions which possess the same terrible habit.

The population of Asia is much more dense than that of Africa, while the character of the vegetation is such that it affords shelter to the tiger almost on the very borders of the villages. The causes for the practice of man-eating are the same as those which affect the lion.

Were it not for the presence of civilised man, with his flocks and herds, a tiger could never reach old age. Its stiffening, or rather failing, limbs would no longer enable it to capture the deer and other active animals which are its natural prey, nor could its

blunted teeth tear the dead carcass in pieces. It would become more and more feeble, and in the course of nature would creep to some retired spot, and there breathe its last.

But the presence of civilised man gives it a longer lease of life. For some time it can haunt the outskirts of the villages, picking up a stray ox or goat, and so sustaining life. As the infirmities of age make themselves felt, even so slight an exertion becomes too burdensome, and the animal finds that an old woman or a child that has strayed from the shelter of the house is a still easier prey.

When once established in either of these stages of artificial life the tiger becomes the most terrible foe that the mind of man can conceive. In the graphic language of Colonel W. Campbell, "a confirmed man-eater always lurks in the neighbourhood of villages, or close to some well-frequented road, and rarely preys upon any other animal but man.

"When a tiger thus quarters himself almost at the doors of the inhabitants a curse has indeed fallen upon them. The ryots cannot cultivate their fields but at the risk of their lives. The women dare not fetch water from the well. The persecuted labourers, returning at sunset from their daily toil, may be seen hurrying along with headlong speed, and uttering loud yells in hope of scaring their hidden foe.

"Peace and security are banished from that devoted village. Day after day some member of the little community disappears—the land is filled with

mourning, and the death-lament comes swelling on the evening breeze, instead of the gay notes of the zittar and the merry laugh of light-hearted maidens. The destroying fiend revels in blood, and becomes daily more open in his attacks."

In one district only, that of Kandeish, the officer in command reported that during his four years' tenure of the post the tigers killed annually an average of ninety human beings and six thousand cattle.

An old man-eater develops an amount of cunning which is simply appalling. It never remains for any length of time in one place, but incessantly travels from one village to another, concealing itself with the utmost art, carrying off one of the inhabitants, and immediately making its way to some distant spot. A single tiger has been known to paralyse a triangular district of some forty miles in extent.

The natives feel themselves powerless, and all that they can think of is to offer rice to their numerous divinities. Their only real hope lies in the European, whom they despise and abhor as an unbeliever, but respect for his powers.

Mounted on trained elephants, and guided by native trackers, mostly belonging to the Bheel tribe, the English hunters first discover the beast in its hiding-place, and then destroy it. A remarkable instance of the cunning of an old man-eater is narrated by Colonel W. Campbell in his "Indian Journal."

A man-eating tigress had been tracked for four days by the Bheels, and at last "harboured," as stag-

hunters say, in a small thicket. As the party approached, the tigress charged them, and then retreated to the thicket. The elephant was taken through the cover, but the tigress had slipped out. Guided by a Bheel, who walked by the elephant's side, the track was followed for some distance. Making a circuit, it led back to the thicket, but again the cover was empty.

On making a "cast" to discover the lost track, a fresh footprint of a tiger was seen over that of the elephant. Again a circuit was made, and with the same result.

Completely puzzled, the Bheel was about to start off on foot in search of the track, when one of the hunters happened to look back and saw the tiger crouching behind the elephant, and scarcely visible. The crafty animal had been creeping after the elephant, waiting for an opportunity of pouncing on the Bheel as soon as he left his shelter.

Had it not been for the casual glance by which the position of the animal was detected the device would have been successful. As it was the hunter placed a bullet between her eyes as she was watching the Bheel, whom she instinctively knew to be the real element of danger to her. The exultation of the little man may well be conceived, and has been very aptly rendered by the artist in the tailpiece to this chapter.

Comedy and tragedy go hand in hand in these hunts.

CREEPING AFTER THE ELEPHANT.



An amusing example of the former is given by the same traveller.

A tiger had been wounded, but although one of its hind legs was broken it made its way into a patch of high grass, and hid there. Guided by the Bheels, the elephant entered the grass patch for the purpose of driving out the tiger. The cunning animal allowed the party to pass, and then sprang at one of the Bheels, "a little, hairy, bandy-legged man, more like a satyr than a human being."

The Bheel dashed at the nearest tree, and, owing to the broken leg of the tiger, was able to climb out of reach. Finding himself safe, the Bheel "commenced a philippic against the father, mother, sisters, aunts, nieces, and children of his helpless enemy, who sat with glaring eyeballs fixed on his contemptible little enemy, and roaring as if his heart would break with rage.

"As the excited orator warmed by his own eloquence he began skipping from branch to branch, grinning and chattering with the emphasis of an enraged baboon; pouring out a torrent of the most foul abuse, and attributing to the tiger's family in general, and his female relatives in particular, every crime and atrocity that ever was or will be committed.

"Occasionally he varied his insults by roaring in imitation of the tiger; and at last when fairly exhausted, he leaned forward till he appeared to be within the grasp of the enraged animal, and ended this inimitable scene by spitting in his face."

Sometimes the tragic element prevails.

In one of these too numerous instances a man-eater, which for six months had been the terror of the neighbourhood, had been tracked down, and was seen to creep into a ravine. The beaters were at once ordered off, as they could not be of service, and might be charged by the tiger, which had already been rendered furious by a wound.

Unfortunately these men are in the habit of half intoxicating themselves with opium before driving the tiger from its refuge, and one of them who had taken too large a dose refused to escape, and challenged the tiger, drawing his sword and waving it defiantly. In a moment the animal sprang upon him, dashed him to the ground with a blow of his paw, and turned to bay.

After a series of desperate charges he was killed. The hunters then went to the assistance of the wounded man, but found that he was past all aid ; the lower part of his face, including both jaws, having been carried away as if by a cannon-ball.

The terrific effect of the single blow indicates the power of the limb which struck it. Had the blow taken effect a few inches higher the whole of the head would have been carried away. By a similar blow a tiger has been known to crush the skull of an ox so completely that when handled the broken bones felt as if they were loose in a bag.

The wonder at this terrific strength diminishes when the limb is measured. The tiger which killed

the foolhardy man was by no means a large one, measuring nine feet five inches from the nose to the tip of the tail ; yet the girth of the forearm was two feet seven inches. The corresponding limb



of a very powerful man scarcely exceeds a foot in circumference. I have not had the opportunity of dissecting a tiger, but I helped to dissect a lion which

is possessed of similar powers, and was struck with wonder at the tremendous development of the muscles of the forelegs.

Not until it becomes a man-eater is the tiger much dreaded, especially in the case of those natives who do not possess flocks or herds. Indeed, when an Englishman has offered to kill a tiger whose lair was well known, he has been requested not to do so, as the tiger did no harm, and killed so many deer that it supplied the neighbours with meat.

A remarkable example of this mutual fellowship between man and tiger is narrated by Colonel Campbell.

Hearing shrieks of distress, he ran to the rescue, and found that they proceeded from a young lad of fifteen, on whom his father, a celebrated hunter and bush-ranger named Kamah, was operating with a bamboo.

His crime was that he had killed a tiger! Most people would have thought it a most gallant action and felt proud of their son. Not so Kamah, who was full of angry regret.

"It is all very well for those who live in the open country to wage war with tigers, but with us who live on social terms with them in the jungle, the case is different.

"I have no quarrel with the tigers. I never injured one of them—they never injured me; and while there was peace between us I went among them without fear of danger. But now this young rascal

has picked a quarrel there is no saying where the feud will end."

Whereupon the discipline of the bamboo was renewed.

The tigress is much more to be dreaded as a man-eater than the male animal. Should she happen to have cubs it is necessary to kill the entire family, as the young ones have been accustomed from the first to feed on human flesh, and begin, instead of ending, by being man-eaters.

Sometimes the tiger is captured alive, and then, as a rule, it loses all its fiery courage, and becomes an abject coward. There are a few exceptions, as in the case of "Jungla," the once celebrated fighting tiger belonging to a late King of Oude. Besides being a singularly fine animal, he was remarkable for having most of the stripes on his sides double. Between many of the double stripes were a number of little spots like those of the leopard, gathered most thickly upon the shoulders and flanks.

In the jungle a tiger would make short work of any buffalo, but when the animals are pitted against each other in an enclosure the tiger shows no fight, letting itself be tossed without offering any resistance.

In one such fight, if fight it could be called, a single buffalo was matched with two tigers, and did what he liked with them, so that at last the spectators shot the wounded animals out of compassion.

Jungla, however, was made of sterner stuff, and was never vanquished. I had an opportunity of seeing

him when he was brought to England in 1869, and a good portrait of him was executed by Mr. Harrison Weir for my "Illustrated Natural History." When pitted against a buffalo he bided his time, sprang at the head, and with a mixed blow and wrench dislocated its neck, his hind feet being on the ground.

These semi-tame tigers, which are kept for fighting purposes, form a connecting link between the wild animal and those which are kept in menageries for the purpose of exhibition.





2.—CAPTIVE TIGERS.



N captivity, the tiger is a much more troublesome beast than the lion. It is not nearly so amenable to human influence, and, in consequence, is seldom employed in sensational performances. Performing lions are common enough, but performing tigers are very seldom seen.

There are now several lion-tamers, who have trained seven or eight lions to live harmoniously in the same cage, and to go through sundry performances, such as leaping over sticks, through hoops, even when they are wrapped with strips of cotton soaked with paraffin, and then lighted.

This is a most wonderful feat, for all wild beasts, and especially the great carnivora, which are nocturnal in their habits, are very much afraid of fire, and, as is well known to travellers, can be kept at a distance from the camp at night by surrounding it with a circle of fires. Not even the lowing of oxen or the bleat-

ing of goats will induce a lion, leopard, or tiger to enter the fiery circle, and it is most wonderful that the animal should be taught by man to leap through a blazing hoop not much larger in diameter than its own body.

But I believe that not the most experienced and daring of wild beast tamers ever ventured to put eight tigers into one cage, and teach them to perform tricks which are quite at variance with their natural instincts. Of course, there is a distinct individuality among tigers as among ourselves, some being gentle and tolerably tractable, while others are fierce, morose, and not to be trusted. In Mr. G. Sanger's menagerie at Margate there are two tigresses which are of exactly opposite characters. Both go by the name of "Bessy," there being an extraordinary lack of originality in the nomenclature of animals. Even in stables the same monotony is paramount. In great establishments, for example, where the owner has taken pains to give appropriate names to the animals, the grooms almost invariably ignore the name which has been given by the owner, and employ their own more familiar language. So, though over each stall may be the name of "Grand Duke," "Black Prince," "Crusader," or similar names, they are all "Bill," "Tommy," "Dick," and so forth to the grooms, and answer to no other names.

These two "Bessys" are, as I mentioned, of diametrically opposed characters. The difference may partly be owing to the accident of birth, one having been captured while young, and the other born in a

menagerie. One might naturally imagine that the latter would be the better tempered of the two, she never having known the freedom of savage life. But, in accordance with the invariable rule, the "forest-bred" animal is the tamer, those which have been born in captivity being always uncertain in their ways, and not to be trusted.

Now, "Bessy the First" is forest-bred. The head keeper, Walter Stratford, has the most perfect confidence in her, and can take any liberties with her. After I had paid several visits to the menagerie, I thought that she began to recognise me, and therefore cultivated her acquaintance. Now, as soon as I enter the house, Bessy tries to attract my attention, expects to be patted and stroked, her ears to be pulled, and her nose rubbed, just as a pet cat would do.

One day I had an unexpected experience with her.

Nearly the whole of the end of the room is occupied by a huge cage, in which Stratford delights in putting all sorts of incongruous animals. There are several varieties of monkeys, a porcupine, a goat, some rabbits and guinea pigs, a few geese and ducks, four cats, a coati-mondi, two racoons, a jackal, a little white Pomeranian dog named "Rose," two hybrids, having the jackal as their father, and Rose as their mother, two pigs, and other animals.

Thinking that the goat would like some fresh grass, I went to the lawn, gathered a large handful, and brought it to the goat. Not a blade of that grass

did she get. I had hardly held the grass to the bars when Rose and her children flew at it, drove the goat away, and literally tore the grass out of my hands. Three times did I fetch grass before the goat was allowed to eat a blade of it. Ever since that time I have always furnished myself with a good supply of grass before visiting these animals.

On one occasion I stopped as usual at Bessy's cage, and noticed that she stared fixedly at the grass. So I said jokingly, "Why, Bessy, you cannot want grass. However, here it is if you want it." So I put my hand into the cage, and was much surprised by seeing her gently scrape the grass out of my hand with her huge paw. Then she lay down, gathered the grass between her paws, and licked up every particle of it. When she had finished it she looked appealingly in my face as if asking for another supply ; so I fetched a fresh handful, the whole of which she took in the same dainty way. Meanwhile, Rose and her children were performing the most extraordinary antics at the end of the room. They had seen me bring in the grass, and naturally imagined that it was intended for them as usual. What with disappointment, and what with jealousy, they were simply frantic, barking, yelping, jumping up and down, scratching at the bars of the cage and expressing their outraged feelings in the most ludicrous fashion. Now, I always give Bessy her allowance of grass first, and then take another portion to Rose, her children, and the goat.

It is rather a remarkable fact that the carnivora

are much more eager for the grass than are the deer, camels, antelopes, and other vegetable feeders.

As to "Bessy the First," she is so fond of Stratford, and places such reliance on him, that when she has cubs, she will allow him to enter the cage, take away the cubs, and hand them about among the visitors. In fact, she is quite pleased to see that her offspring attract so much attention.

Very different is "Bessy the Second." She never had a very good temper, but was not considered to be a dangerous animal, until an event occurred which completely altered, or at all events had an evil influence upon her character.

Nearly two years ago three young lion cubs were in the next cage to hers. One day she seemed to be seized with a sudden frenzy, smashed the partition between the cages, flew at the cubs, and killed two of them in a moment. The whole attack was so quick and unexpected that Stratford had only just time to save the life of the third cub. Since that time she has been most carefully watched, for when once a lion or a tiger has broken through a cage, it is apt to repeat the operation.

The reader may perhaps call to mind a startling event which took place some years ago in Ratcliffe Highway. A tigress belonging to Mr. Jamrach had broken out of her cage, escaped into the road, seized a young boy and carried him off. The boy, not being a naturalist, thought that she was a handsome kind of dog, and began to pat her, when the animal caught

him by the shoulder, and ran down the street. Mr. Jamrach, a man of vast proportions, flung himself on the tigress, caught her by the loose skin of the neck, got his arm round her throat, and garotted her so effectually that she loosened her hold, the boy being not much the worse for his terrible experience.



TIGER AT LARGE.

On seeing the account of this gallant action, I went to see Mr. Jamrach, and learned the details. He treated the matter very lightly, and said, in his imperfect but quaint English, that he "drowed himself upon her and strangulated her."

The same animal was afterwards placed in Edmonds's menagerie, the cage next her own being occupied by

a lion. She broke down the partition, fought the lion and killed him, she herself suffering much damage. Altogether, she was rather an expensive animal. She cost Jamrach three hundred pounds, paid as compensation to the boy, while Edmonds's lion which she killed was worth about as much.

Now, "Bessy the Second" displays a very similar character. She is restless, morose, and suspicious, and if any of the animals make a sudden movement, she starts up, stares at them through the bars, and often sets up a series of roars, which have the effect of causing every lion and tiger in the place to roar for sympathy, so that the noise is deafening.

Last summer she was greatly disconcerted at a photographer, who wished to take portraits of some of the animals, and she disturbed them all so incessantly that a really successful portrait could not be secured. The only way in which a photograph of any kind could be taken was to place the camera and black cloth before the cage, leave it there for an hour or two, visiting it at intervals until the suspicious animal had become accustomed to it. Then the operator put the cloth over his head, and threw it off again, until at last the tigress realised the fact that the black cloth was not a personal enemy.

I have tried to make friends with her, but at present without the least success. It is a great pity that her temper is so bad, for she is a fine animal, and being quite young, has in all probability a long life before her.



THE LION.



VII.

THE LION.

1.—IN A STATE OF NATURE.



ONSIDERED as a direct foe to man, the Lion is not nearly as formidable as its first cousin the tiger.

Formidable it certainly is, but it is losing power yearly. It is being "crowded out," and many lands through which it roamed at will can never again tremble at the thunder of its earth-shaking roar.

Taking, far example, acknowledged history, which is but a grain of sand on the shore of creation, we find that the Lion inhabited Europe. Supposing that a general European war were to break out, neither of the combatants would be obliged to take precautions against the Lion as a hindrance to the transport service. Yet, we find Herodotus, "the Father of History," as he has often been called, stating that the army of Xerxes was attacked by

lions near Thessalonica (now known as Salonica), and that the lions only attacked the camels, not meddling with the men, or even with the horses.

The reason is evident enough. The Lions knew by experience that Man possessed bows, arrows, spears, and nets, and was a mysterious animal which could not be attacked without danger. Horses, too, were swift of foot, and could not be captured without more trouble than a Lion cares to take. Moreover, the horse has an awkward way of lashing out with its hind hoofs when it can turn upon its enemy. Whereas, the camel is too slow of foot to escape by speed, and has no hoofs of which the Lion would be afraid.

That the Lion was once plentiful we find from many passages of the Old Testament, too numerous for quotation. At the present day, the Lion is as extinct in Palestine as it is in Europe, and the shepherd need no longer fear it as a devastator of his flocks. The Lion is "crowded out," obeying the same law as that which has extirpated the aboriginal Tasmanians, and which is gradually destroying the Maori of New Zealand, the Papuan of Fiji, the Black Man of Australia, and the Red Man of Northern America. They want too much room. It is impossible, for example, for a Red Man to maintain his family in comfort on less than a thousand acres of soil, so that when he comes in contact with races to whom a hundredth part of that land is sufficient, he is obliged to retire before them.



THE LION.

So it is with the Lion. His stronghold is Africa, though he extends partly into Asia, where he overlaps the domain of the tiger. But Africa is being invaded on all sides by Europeans, and in consequence the Lion has to retire before the conquering race. The animal is as practically extinct in Durban, Graham's Town, Cape Town, or indeed any European settlement, as in Greece or Palestine.

Still, throughout the greater part of Africa the Lion maintains its sway, but it is never as actively aggressive as the tiger. Even when age and infirmity compel it to become a man-eater, it does not desolate whole districts, as does the tiger, but confines its depredations within a comparatively small limit. Except when an intruder passes near the spot where

it is nurturing its young, it will seldom take the initiative and attack man, but will try to slip away quietly.

Sometimes, however, there are exceptions to this rule, one of which forms the subject of the illustration on the opposite page.

The celebrated hunter, Gordon Cumming, had halted for the night, and, according to his custom, had protected his camp with a strong hedge of thorn branches, technically named a "kraal." His Hottentot followers, however, preferred to make a fire of their own under a thorn bush, about fifty yards from the kraal. With them was a little Bosjesman (pronounced "Bushesman"), named Ruyter, who was a faithful servant during Gordon Cumming's sojourn in Africa, and afterwards accompanied his master to England.

"About three hours after sundown I called my men to come and take their coffee; and after supper three of them, John Stofolus, Hendrick, and Ruyter, returned to their own fireside, and lay down. Hendrick and Ruyter lay on one side of the fire under one blanket and Stofolus on the other. At this moment I was eating some barley broth at my fire, which was small, for, owing to our proximity to the village, wood was very scarce. The night was pitch dark and windy.

"Suddenly the appalling and savage roar of an angry Lion burst upon my ears within a few yards of us, followed by the shrieking of the Hottentots;



HENDRICK AND THE LION.

again and again the murderous roar of attack was repeated. We heard John and Ruyter shriek ; still, for a few moments we thought that the Lion was only chasing one of the dogs round the kraal. But the next instant Stofolus rushed into the midst of us almost speechless with terror, his eyes bursting from their sockets, and shrieked out,

“ ‘ The Lion ! the Lion !

“ ‘ He has got Hendrick !

“ ‘ He dragged him away from the fire beside me !

“ ‘ I struck him on the head with the burning brands, but he would not let go his hold. Hendrick is dead ! Hendrick is dead ! Let us take fire and seek him.’ ”

Knowing that nothing could help poor Hendrick, Gordon Cumming got all the men into the kraal, loosed the dogs, increased the fires, and waited for sunrise. It appeared that the Lion had sprung upon Hendrick and Ruyter as they lay under the same blanket, coiled up in true Hottentot fashion, and had seized the former, only wounding the latter with his claws. Hendrick could not have suffered much, being only able to utter one faint cry for help.

In the course of the day the Lion was tracked and killed, his skin being placed in Gordon Cumming’s splendid collection. I paid more than one visit to the collection when it was exhibited in London, and became very friendly with Ruyter, mostly through the medium of shillings, under which stimulus he became exceedingly communicative. He could speak

no English, and I only knew a few words of Dutch, but he possessed to the full the dramatic power which is inherent in the Bosjesman, and gave me a most vivid description of the terrible scene.

He rolled himself in a blanket, and lay coiled upon the ground. Then he gave the roar of the Lion with appalling power and fidelity, followed by the shriek of the victim and the muffled grumbling of the Lion as he carried off his prey. Then he pointed with immense glee to the skin of the Lion, and poured upon it a torrent of voluble abuse, the meaning of which was evident, though I was, perhaps fortunately, unable to understand the words. The Lion was evidently a man-eater, which was hanging about the village for the purpose of picking up one of the inhabitants who might happen to stray from shelter, and had taken advantage of the reckless conduct of the Hottentots. The animal was known and dreaded by the villagers, and great were the rejoicings over its dead body.

Gordon Cumming expressed his opinion that the man-eating habits of the Lion are often attributable to the laziness of the natives.

"The Bechuanas of the far interior do not bury their dead, but unceremoniously carry them forth, and leave them lying exposed in the forest or on the plain, a prey to the Lion and hyæna, or the jackal and vulture; and I can readily imagine that a Lion, having thus once tasted human flesh, would have little hesitation, when opportunity presented itself, in

springing upon and carrying off the unwary traveller or Bechuana inhabiting its country."

Some five or six so-called "species" of Lion are said by some zoologists to exist, but I cannot think that they are more than mere varieties of a single species. The "Maneless Lion" of Gujerat, for ex-



LION AND LIONESS ON THE LOOK OUT.

ample, has been conclusively shown to be only a young male whose mane has not had time to grow. As to the Black-maned and Yellow-maned Lions of South Africa, they are, as will presently be seen, merely the same animal at different ages, the mane and tail-tuft beginning to blacken in the third year. The Dutch colonists call them respectively, "Schwartz fore-life" and "Chiel fore-life."

There is in fact but one species of Lion, though it varies slightly according to age and locality. In point of size, the Lion is not so large an animal as the tiger, though the mane and long fringes of the flanks give it the appearance of being much larger. A large South African male Lion measures, on an average, seven feet from the nose to the root of the tail, the tail itself measuring three feet in length. As to the character of the Lion, it may be summed up in a few words.

It is a big cat.

As to its courage, opinions somewhat vary, owing, as I imagine, to the character of the describer. Some travellers, such, for example, as Jules Gerard, the "Lion-slayer," as he modestly termed himself, speak of its courage with the greatest awe. Dr. Livingstone, on the other hand, had a very mean opinion of the animal's prowess.

This is the more remarkable, because, as he was once seized by a Lion, and his arm crushed in the animal's jaws, he might have been expected to hold a very different opinion. Probably the truth lies between these extremes, and the Lion is neither more or less courageous than might be expected from a cat.

Some years ago, when Mr. J. Cooper was exhibiting his cage of eight trained Lions at the Crystal Palace, some nervous residents objected to the exhibition, on the ground that a Lion or two might escape and devour the inhabitants. I happened to be talking to

him when he was "interviewed" by a reporter on the subject. Mr. Cooper laughingly replied that if a Lion should escape, he would be more frightened than anybody else.

A friend of mine, an American lady, well known in the literary world, once met with an adventure which corroborates Mr. Cooper's remark.

She was walking on the outskirts of New York, when she almost stumbled over a Lion. The animal was lying on the ground, and looked so like a sandy hillock, that she did not notice it until she was quite close. Rendered motionless by the shock, she could not move, and stared at the Lion. The animal seemed quite as much disconcerted as herself, and stared at her without moving or attempting to spring upon her.

Presently it began to back itself slowly, and then made off. Of course it had escaped from a menagerie.





2.—IN CAPTIVITY.

HAVE already mentioned that the Lion is losing ground in his own country. It has been said, and I think with some truth, that a "Hunter of the Prairies" must soon visit Europe to see a bison, and that in a few years an inhabitant of Australia, if he should want to see a living kangaroo, will be obliged to go to England and pay a visit to the Zoological Gardens. Perhaps the time may be at hand when a native of Africa or Asia will be forced to visit an English menagerie in order to see a Lion or Tiger. Taking the whole of England, and marking out on the map of Africa or Asia a tract of similar area, I am inclined to fancy that in England there are at present nearly as many Lions as in either of the African or Asiatic districts.

Why we should want so many Lions seems something of a mystery. They are expensive animals to maintain, they need the constant attendance

of skilled keepers, and they endanger the lives and limbs of those with whom they are brought in contact. They cannot even be taught, like the leopards of Bacchus, to draw a two-wheeled chariot.

Yet that they have a real value is shown by the fact that their number is steadily increasing, and that, in spite of that fact, their marketable value remains almost unchanged. A Lion cub, for example, when about three months old and still in the striped and mottled state of Lion childhood, can be purchased for about twenty-five pounds. At eighteen months old it will fetch fifty pounds, or even more, while a full-grown male will sell for two hundred pounds if it be an Asiatic animal, and two hundred and fifty if it be an African specimen with a full black-tipped mane.

I need not say that the Lion in captivity is solely used for exhibition, and that the business, when rightly managed, is a profitable one.

When treating of the tiger I mentioned that the "forest-bred animals were much more easily tamed than those which have been born in captivity." The same rule holds good with the Lion, and as the forest-bred animals are not only comparatively rare, but more valuable for training purposes, they fetch much higher prices than their offspring which have been born in a menagerie. Still, Lion-breeding is a profitable business in the hands of experienced men; but such men are not easily found. They must be courageous to the last degree, for if an ill-conditioned

Lion, Tiger, or other "wild beast," should once feel that the keeper is afraid of it, the man's life is in constant danger.

He must be patient as well as courageous, and never lose his temper under any provocation. Then, he must be a close observer, never allowing the slightest trait of character to escape him. Moreover, he must take an unfeigned interest in each animal under his charge, he must have a bright and cheery manner, and keep himself in constant accord with even the most cross-grained beast in the menagerie.

This is by no means an easy task, for in every collection there are always several animals which are exceedingly trying to the temper. But the keeper who knows and does his business is especially careful of himself when dealing with these unpleasant creatures. He knows that if he were to display any irritation against one of them it would be noticed by the other animals, and would weaken his moral influence over them.

A good keeper will make his influence felt as soon as he enters the building, as can be seen from the altered demeanour of the animals. The quarrelsome ones subside into quiet, and cast uneasy glances in his direction, and the noisy animals who were worrying their companions by their turbulence, try to look as if they were the most peaceable inmates of the place. Those with which he is on particularly good terms come forward, press themselves against the bars, and do their best to attract his attention.

As an example of the pains which a keeper must take, even in the management of a single species, I will briefly describe the care which must be exercised in rearing the young of the Lion.

For some time the cubs must be watched as rigidly as if they were human babies, being liable to a variety



LION AND HIS KEEPER.

of infantine ailments. As with man, one of the most important periods of a young Lion's life is its teething, which, with these animals, occupies much of the first two years of its life. About the first set, or "milk teeth," there is comparatively little trouble, but when these teeth are shed for the purpose of making way for the permanent set, the troubles of the young Lion and its keeper begin.

As with ourselves, there is much difference in individuals, some getting through the trying process with comparatively little difficulty, while many suffer severely, and some die from exhaustion.

The progress of teething gives both the keeper and owner constant anxiety, because much of the future value of the animal depends upon it. For example, there are now in Mr. G. Sanger's collection at Margate two male Lions in neighbouring cages, one being three years of age, while the other is a year younger. By reason of its age the elder animal has a larger and blacker mane, but the younger is already the superior in general dimensions, and bids fair to become an exceedingly valuable animal.

The cause of this difference is to be found in the teeth. Those of the younger Lion were changed without difficulty, while those of the elder are even yet incomplete. There is one milk tooth of which the animal has not been able to rid itself, so that there is a constant dribbling from the side of the mouth. It is not much, but, little as it may be, the growth of the animal is so seriously affected by it that the keeper is anxiously devising some plan by which he can remove the offending tooth.

Under ordinary circumstances, it is sufficient to supply the animal with a bone which is too large for it to break, and on which it can try its teeth, just as a human baby bites upon a coral. It is necessary that the bone should be a strong one; as otherwise there would be danger of breaking and swallowing

the splinters. When the bone, as in this case, is of no effect, the keeper contrives to push a thick piece of hard wood between the animal's jaws, and then with a pair of forceps he twists out the tooth before the patient understands that anything is going to happen to it. With this particular Lion, however, the tooth is so much decayed that the keeper thinks that he will be obliged to use chloroform.

The Lions are grateful creatures, and do not forget any kindnesses which are bestowed upon them. Indeed, the old story of Androcles and the Lion finds many unrecorded parallels in modern days. For example, there is in the same building a Lioness who was nursed through a most dangerous illness by Stratford, the keeper. She was afflicted with disease of the lungs, an ailment from which a Lion has hardly ever been known to recover. He never left her day or night, even sleeping in the same cage with her.

In consequence, she allows him to do anything with her, and if she thought that he were in danger would at once go to his rescue. Just at present she is occupying the same cage as the well-known Lion "Wallace." Now, for reasons of his own, Wallace bears a grudge against Stratford, and does not like him to enter the cage. His companion, however, is only too glad to welcome his presence, and if Wallace makes any hostile demonstrations she interferes and drives him back.

Wallace certainly has some grounds for his dislike.

There was a coloured man named Humphries, who performed as a Lion-tamer under the name of "Alicamoosa."

In January, 1881, Alicamoosa was performing at the Bingley Hall, Birmingham, and began his performance as usual by driving the Lions round the cage. Suddenly Wallace sprang at him, and struck him on the face, making three deep wounds, two on one side and one on the other. Of course, the force of the blow flung him down, and while he was lying on the floor of the cage Wallace bit him on the arm.

He had presence of mind enough to lie still while Stratford came to the rescue with an iron bar, striking the lion on the jaws, so that he could not retain his hold of the man's arm. Alicamoosa then crawled slowly backwards, while the animal was confused by the blows on its mouth, and made his way to the door. In the course of his performances he used a revolver loaded with blank cartridges, and fortunately had not reached that part of the "business," so that the weapon was still loaded. He then fired two of the barrels in the animal's face, and was drawn out of the cage under cover of the smoke.

After this mishap Wallace was not allowed to perform again. Humphries was too much injured to continue his performances, but Stratford dressed himself in Alicamoosa's performing costume, blackened his face and hands, put the Lions through their performances, and so enabled the proprietor to carry on the exhibition as if nothing had happened.

Wallace was born in the Agricultural Hall in 1874. Judging by our own children, or even by our domesticated animals, we might naturally imagine that when a Lion is to be trained for the purpose of going through certain performances the process cannot be commenced at too early an age, so that the animal's first ideas should be based upon obedience to man.

This is, however, another instance of the diversity between theory and practice. The character of the Lion is not developed until it has at least completed its third year, and therefore an experienced Lion-tamer never takes a pupil until it is fully three years old, so that the keeper has been able to study its disposition.

Even when trained there is a very great difference between the animals. Some will go through their performance as if they enjoyed it, while others are lazy and sulky, and have to be reminded of their duty by the whip. Others, again, resent the whip, but will obey the voice, so that the trainer has to study the individual character of each animal under his charge.

Sometimes the apparent ferocity of a performing Lion is often feigned.

For example, Mr. J. Cooper, one of the best living Lion-tamers, produces a sensational effect at his performances. Just as he closes the door of the cage one of the Lions flies at him with a tremendous roar, and apparently misses him by half a second or so. It is only a trick, the Lion having been trained to

strike at the bars of the cage just above the door, and not at its master. This, however, is not noticed by the spectators, the roar and leap completely diverting their attention.

In the same collection there is a fine Lioness called "Victoria." She has a couple of cubs about four months old, and allows Stratford to pick them up, or even to take them out of the cage for the admiration of visitors. On one occasion, when he entered the cage, I was much amused at the unceremonious way in which he treated her. She happened to be standing with her hind quarters partly across the door, so that he could not fasten it. So he set his back against her body, put his foot against the side of the cage, and pushed her aside by main force.

As to its food, the Lion consumes less than might be imagined, and it is better for the health of the animals if they are kept without food one day in each week. Sunday is always chosen as the fasting day, as visitors always look forward to seeing the Lions fed upon the week-days.



A FOUR-HANDED RACE.



VIII.

A FOUR-HANDED RACE.

1.—INTRODUCTION.



EXT to man himself, the monkeys, including apes, are placed at the head of the animal kingdom. The reason is evident enough, for, of all other creatures, they most resemble ourselves. And yet how different they are! No one on seeing a human being and an ape standing side by side, could possibly mistake the one for the other, or confound the man with the beast. The man stands erect upon his feet, his small and well-shaped head balanced evenly upon his shoulders, with every part of his body in perfect proportion. His forehead is broad and high, showing that the brain is large and well developed, and every detail of his frame bears witness that he is a being whose strength lies in his intellect, and not in mere brute force.

Not so the ape, whose form is in many ways of a

coarser and lower type. His muscular power is greater, it is true, but his body is ill-shaped and ungainly. His head is large, clumsy, and sunk upon his shoulders; the forehead is low and receding, showing that but little space is provided for the



FOOT OF GORILLA.

brain. His arms seem to be too long, and the legs too short, when compared with the rest of the body. There is also another important difference, which lies in the fact that the animal is unable to stand perfectly upright. The reason for this we may find in the structure of the legs and feet.

If we look at the feet of an ape we see at once that they are formed like hands, having no heels, and being furnished with thumbs and fingers instead of toes. Consequently they cannot be placed flat upon the ground, as our feet can, but can only be planted sideways. Then there is scarcely any calf to the leg, and the knee cannot be straightened. However, the ape is able to assume a tolerably erect position, and can even walk in a clumsy manner upon its hind feet alone. But it always seems in danger of falling over. The weighty head overbalances the body, and forces the animal to aid its progress by means of its long arms. These, indeed, it sometimes uses as crutches, placing the hands upon the ground and swinging the body between them.

Yet in spite of these great distinctions between the man and the beast, the monkeys bear a closer resemblance to the human form than any other animal, and they are considered to hold, next to man, the first place in the arrangement of Nature.

Now we find that the structure of every living creature is that which is best suited to its mode of life, and that every part of its frame is exactly suited to the work which it has to perform. For instance, animals such as the lion and the tiger, designed to capture living creatures as their prey, are provided with powerful teeth and talons with which to seize their victims and retain them when captured. The giraffe is intended to feed upon the foliage of trees; therefore its neck is very long, in order that the

animal may be enabled to reach a sufficient height, and the tongue is formed expressly for the purpose of plucking leaves from the branches.

Again, those animals which pass their existence in the water, such as the whale, the seal, and the porpoise, are formed almost like fish, in order that they may swim and dive with ease and rapidity. Some, such as the bat, are obliged to seek their prey in the air, and are accordingly furnished with wings, enabling them to fly with almost the agility of the swiftest birds.

The monkeys are no exception to this rule; and we shall see how admirably their structure is adapted to their mode of life. When we see a monkey of any kind endeavouring to stand erect upon its feet, and imitate the movements of a human being, we consider it to be a very clumsy and ungainly animal. And so it is; for it is then placed in an unnatural position, and is just as awkward as we should appear were we to try to rival its antics among the trees. If we were to watch it in its native forests we should soon find cause to alter our opinion. The monkey is formed for a life spent among the branches of trees, and not for one spent upon the ground. In its natural haunts its long arms and hand-like feet, ill-suited as they are for walking upon the land, are admirably adapted to its needs, enabling the animal to gain a far more secure hold than if they were formed like our own.

We all know that when a man climbs a tree he

is obliged to depend far more upon his hands than upon his feet. We may, therefore, easily imagine how far more valuable, in its mode of life, its four hands are to a monkey than would be the two hands and two feet with which we are provided. We can-



HANDS OF MONKEYS.

not grasp a branch with our feet, but the monkey is able to do so, and therefore has a great advantage over us in climbing among the trees.

Some monkeys of the New World are still more highly gifted, for their long flexible tail answers the purpose of a fifth hand, by means of which they can swing from a branch while the four paws are em-

ployed for other purposes. And this tail is useful in more ways than one, for the tip is endowed with so delicate a sense of touch, that it can pick up a single nut, or pluck a leaf, almost as readily and easily as can the hand itself.

Now, of course, in a large family like that of the monkeys, which procure their food in various ways, the animals composing it cannot all bear a very strong resemblance to one another. We must, therefore, divide them into a number of groups or families, placing together those which appear most nearly related, and striving, as far as possible, to discover and preserve their natural order.





2.—THE APES.



T the head of the monkey family stand several large and powerful animals called by the name of Apes. Because of their resemblance to man, the greatest of these are called "anthropoid," that is, man-like apes. They differ from the other monkeys in several characters. In the first place they are not provided with the curious cheek-pouches which many monkeys possess, and which serve as pockets to contain food until the animal is ready to devour it. Then, no ape has the least vestige of a tail. They are not to be confounded with baboons. They have not the patches of hardened skin upon the hind quarters which all baboons possess. The largest of the apes, and, indeed, of all the monkey family, is the fierce and savage GORILLA, which is a native of Western Africa. We do not know very much of its habits, as it dwells in the thickest forests and is very seldom

seen by man. We do know, however, that its nature is very ferocious and savage, and that its great strength and courage render it a most terrible foe even to man himself. So powerful is the gorilla, indeed, that it has actually been seen to bend a gun-barrel double with the greatest ease, twisting it with its huge paws almost as readily as if it had been a straw. Even the most experienced hunters are very cautious when approaching the haunts of so strong and fierce an animal ; and the natives of the countries it inhabits are said to fear it far more than the most savage lion. These natives, however, do not consider the large apes to be brutes at all, but think that they are wild men, who hide themselves in the woods and pretend to be dumb, in order that they may not be captured and made to work.

The aspect of the full-grown gorilla is most brutal, and bears only a very distant likeness to the human countenance. Indeed, although in the scale of nature the gorilla stands next to man, there are many monkeys which resemble him far more in face if not in form. While the gorilla is yet young the difference is not so great, and a well-known traveller states that the head of a baby-gorilla might easily be mistaken for that of a negro child. The likeness is rendered still more striking by the form of the ears, which are very small when compared with those of other monkeys, and lie closely against the head. The nails, too, are almost exactly like those of man. The gorilla can also be known by the structure of



GORILLA.

the hands, the fingers of which are united up to the first joint. These characters were very well shown in the little female gorilla, "Gena," which lived for a short time in the Crystal Palace. As, however, the animal increases in size, it loses its almost human



HEAD OF GORILLA.

appearance and assumes a dull, fierce, and brutal aspect.

We often hear that the gorilla is much taller even than a tall man, and that he sometimes attains to the height of eight feet. In like manner we hear of elephants fifteen or even twenty feet high, whereas few reach the height of more than eleven feet. In reality the largest example known of the gorilla mea-

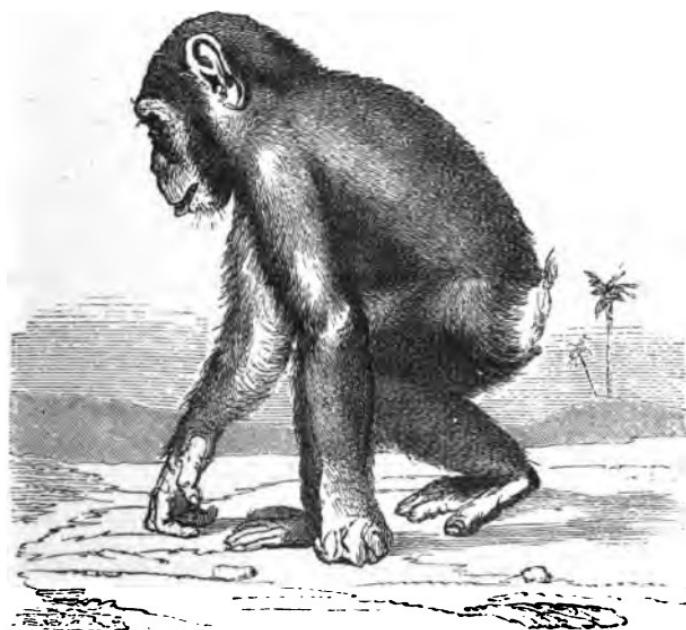
sures just five feet six inches in height, although its breadth of body is very much greater than in a man of the same height. The paws are immensely large, the hands often measuring nine or ten inches in diameter, that is, more than double the width of those of a man.

The next of the apes is the CHIMPANZEE, which is found in the same parts of Africa as the gorilla. It looks something like the gorilla, but may be known by the pinkness of the skin, the large and projecting ears, and the form of the hands, the fingers of which are separated as far as the palms of the hand, as in man. The most curious fact about it is that it does not live among the trees like almost all monkeys, but passes its life upon the ground. A number generally band together, and form so powerful an array that even the lion fears to attack them.

Another of the anthropoid or man-like apes is the ORANG-OUTAN (*Simia Satyrus*), of which so many strange tales have been told, some true, some partly true, and some altogether false. We will content ourselves with telling the truth.

It inhabits Borneo, where the inhabitants seem to hold it in the highest estimation, as indeed is seen by the name Orang-outan; which signifies in the Malayan language, Man of the Woods. Another native name for it is "Mias." As may be seen from its aspect in the picture on page 163, it is essentially an inhabitant of trees, its peculiarly shaped paws being quite unfitted for walking on the ground.

In fact, when an Orang-outan is on the ground, it seems as awkward as a man would do if he had to walk on his fingers and toes over a flinty road. When it does walk it always assists itself by bending



CHIMPANZEE.]

its fingers, placing the backs of the knuckles on the ground, and swinging its short legs between them as if it were on crutches.

The legs, too, are exceedingly short in proportion to the body, while the arms are enormously long. Neither can be said to be disproportional, as both are exactly proportioned to the work they have to perform.

The enormously long arms and powerfully built chest make the creature appear very much taller than really is the case. Specimens are mentioned which have attained six feet in height, but this I do not in the least believe. An Orang-outan of only five feet in height would be a gigantic animal ; and one of six feet would be to its fellows what an elephant of twenty feet high would be to ordinary elephants.

Mr. A. R. Wallace, who has had more experience with the Orang-outan than most people, says that he can find "not the least reliable evidence of the existence of Orangs in Borneo more than four feet two inches high." He mentions one case where the animal when alive was set down as seven feet high, when lying dead on the ground was reckoned as six feet high, and when submitted to measure proved to be scarcely more than four feet in height.

As a full-grown male which was shot by Mr. Wallace measured seven feet nine inches across the extended arms, and yet was barely four feet two inches in height, it is no matter of surprise that the vast proportions of the arms and width of the shoulders should give a deceptive idea of the height as measured from the heel to the crown of the head.

The reader is particularly requested to look at the peculiar attitude of the hind legs. No human being, were he the most accomplished acrobat that ever performed, could place his legs in such a position. The fact is that the hip joint is differently formed



THE ORANG-OUTAN.

from that of man, and therefore allows the limb a perfect freedom of action.

Now let us look at the enormously long arms. The reader will see that they are covered with very long hair, and that this hair is arranged after a rather curious fashion. As the arms hang by the side, the hair from the shoulder to the elbow points downwards, while from the elbow to the wrist it points upwards.

It is thought that this arrangement of the hair is intended to assist the creature in sheltering itself in the sudden rainstorms which are characteristic of tropical countries. Should the rain fall while the ape is away from a shelter, it squats down, crosses its arms over its breast, and holds each shoulder with the opposite hand. The hairs then act as a sort of thatch, the rain shooting off them as off the eaves of a house. I do not say that these hairs were intended for this purpose, but they certainly have that effect. The strength of the arms is almost incredible. I have engaged in playful struggles with several young specimens, and have always admired their wonderful muscular powers.

Owing to the volume and solidity of these muscles, the Orang-outan is singularly heavy in proportion to its size, so that when an adult Orang-outan is roused to anger, it becomes a foe which no man could withstand without weapons. The teeth, too, of a full-grown Orang-outan are long and powerful, and its bite is scarcely less to be dreaded than that of the tiger.

Fortunately it is not at all an aggressive animal, keeping itself out of man's reach as much as possible, and never fighting unless brought to bay in some spot where it cannot escape without a battle.

It has been said to make huts for itself, and to reside in them. This is partly, but not entirely true. It can weave branches together, so as to form a platform on which it can repose, but to make a hut is a task far beyond the power of any ape. Moreover, none of the monkey tribe can be said to have any residence at all. Their mode of existence forces them to be continually on the move.

Apparent exceptions to this rule may be found in the Hoonumans, or sacred monkeys of India, which pass their whole lives around the temples. These, however, are quite as much domesticated as our house pigeons, which can fly away if they like, but prefer to stay where they find food and a house without the need of searching for them.

It appears to be invariably the case that, whenever a full-grown Orang-outan feels itself mortally wounded, it rapidly twists the branches together, lies down upon the platform and dies upon it, so that its body does not fall to the ground.

It always sleeps upon a similar platform, which is generally about twenty feet from the ground, the ape evidently feeling itself better protected from the weather than it would be if it had made its sleeping platform on the tree-top.



3.—THE GIBBONS.



HE curious long-limbed monkeys known as GIBBONS seem to connect the apes with the baboons, for they possess the chief characters of the former group mingled with those of the latter. Thus, in the general form of their bodies, in the length of the arms, and in the absence of a tail, they resemble the apes. On the other hand, patches of hardened skin are found upon the hind quarters, just as is the case with the baboons.

The universal rule of nature, that the structure of an animal is that best suited to its life and habits, is very well illustrated in the gibbons, which are specially formed for an active existence passed among the branches of trees. Although they resemble the apes in their general form, they are by no means so clumsily built, for their bodies and limbs are much more slender and delicate. Were it not so, the very weight of their bodies would prevent the animals

from traversing the boughs with any great speed, and the long leaps which they are in the habit of taking through the air would be quite impossible. Then the fore paws are formed in a curious, but very useful manner. You may know, perhaps, that when a gymnast is swinging upon a bar he seldom clasps it with his whole hand, but merely hooks his fingers over it, placing the thumb side by side with them. Were he to cling to the bar with his whole hand, the grasp of the thumb would speedily tire the muscles of the arm, and shortly oblige him to loosen his hold. But by placing the thumb side by side with the fingers, the arm is thrown into the best position for exercising its full power. The hand of the gibbon, however, is formed so that it could not clasp a branch even if it were to try, for the thumb is very small indeed, and is placed in a line with the fingers, so that the hand seems almost to be furnished with five fingers instead of four fingers and a thumb. The hinder paws, however, are not altered in this manner, but are like those of the apes, bearing a large and powerful thumb, which is placed in the ordinary position. We have not very far to seek for the reason why the fore paws should be so differently formed from the hinder pair. If we could watch the gambols of a gibbon in his native forest we should see that he supports himself from the branches chiefly by his hands, in which task an ordinary thumb would only be in the way. When he wishes to check his course, however, in his long flights through the air, he clings

to a branch with the hinder feet, whose grasp is sufficiently powerful to instantly arrest his progress.

Then, the chest of the gibbon is very large and broad, in order to allow plenty of space for the lungs to work in. You know that if you run very fast you are obliged to breathe much more quickly than if you had been walking or standing still, and before very long you are obliged to stop in order to regain your breath. But the lungs of the gibbon are so large that he can continue his exertions for a long time without needing to pause for breath, and can throw himself from branch to branch, and tree to tree, without appearing in the least exhausted by his exertions.

In order to still further suit the gibbon for a life among the branches, its arms are of very great length. So long are they indeed, that when fully spread they are twice the entire height of the animal. When it stands upright, too, the finger-tips reach as far as the ankle-joints. Useful as this wonderful length of limb is in the trees, it only seems to incommod the animal when upon the ground. Indeed, although in its leafy haunts the gibbon is by far the most active and graceful of all monkeys, upon the ground it is most awkward and ungainly.

In consequence of their timid nature and great activity, we do not know very much about the habits of the gibbons. Their agility is so great that it is almost impossible to approach them, and in consequence their motion can only be watched from a

distance by means of a telescope. All the gibbons possess the strange power of flinging themselves through the air from one branch to another without any apparent effort. Swinging themselves for a moment or two upon the bough, as though to gain an impetus, they suddenly shoot into the air, and never fail to reach the branch at which they aim. In this manner they pass through the most surprising distances. A leap of thirty or even forty feet is by no means an uncommon performance. And there is a stranger point still about these wonderful leaps. The impulse once gained, the agile monkeys will continue to leap from one bough to another without pausing an instant to gain a fresh spring, merely touching the branch with their fore-paws as they pass along. Even when taken captive, and imprisoned in a cage, the movements of the gibbon appear simply marvellous, and we can imagine how much more so they must be in their native forests, where these active monkeys can travel for mile after mile in any direction without needing to descend to the ground. Indeed, it has been said that a gibbon can pass through the forest with almost the rapidity of a bird, and that its speed and agility are so great that the eye can scarcely follow its movements. It is, in fact, among monkeys what the swallow is among birds.





4.—THE BABOONS.

WHEN we see a BABOON we may easily recognise him by the position of his nostrils, which are placed at the end of the muzzle, instead of lying upon the face just beneath the eyes, as is the case with all the other monkeys. The muzzle, too, is rather peculiar in form, seeming to be abruptly cut off, with a flattened and rounded extremity. In the young baboon these characters are not very strongly marked, and do not fully appear until the growth of the animal is complete. In fact, a baby baboon might easily be mistaken for an adult Macaque, an animal about which we shall presently have something to say.

The head and muzzle of the baboons are not at all unlike those of a dog, and consequently these animals are often called by the name of dog-headed monkeys. The baboons are provided with cheek-pouches, which

the apes and gibbons do not possess, and in which food can be stored up until required for use. Very useful do the monkeys find these natural pockets ; for in them they can carry sufficient food for one or two meals at least, without the slightest trouble to themselves. The baboons are also furnished with tails.

The baboons are perhaps the most sullen and ferocious of all monkeys, the great apes themselves scarcely excepted. And their strength and courage are so great that, even to man himself, they form a far from insignificant foe. Indeed, an unarmed man would have little or no chance in a struggle with a baboon, whose sharp razor-like teeth are capable of inflicting most terrible wounds. The baboon always fights in the same manner. Leaping upon its enemy, it fixes its teeth deeply in his throat, and, firmly holding the body of its victim in its fore-paws, draws its head backwards, thus tearing open the throat. In this manner the baboon is accustomed to baffle the hounds used in hunting it, destroying the nearest of its pursuers before the others can come up.

A number of these animals always unite together into a single herd, and appoint sentinels, whose business it is to warn the others of the approach of danger. Thus, when a lion or leopard is seen approaching, the sentries utter a shrill sharp bark, which is immediately understood by the rest of the band, who collect together in order to repel their foe. Not even the most ravenous lion will dare to attack

a company of these animals ; for if he were to do so, he would certainly be torn to pieces by the ferocious creatures.

Not only do the baboons band themselves together



in order to repel their foes, but they also combine for the purpose of robbing the orchards and plantations in their neighbourhood. This they do in a most crafty and ingenious manner. If the whole

number were to enter the orchard they could scarcely hope to escape detection. But two or three of the most cunning animals of the band are deputed for this purpose. The rest of the flock then stand a few feet apart, in a long line, reaching from the plantation to their own retreat among the rocks. A number of sentries are always placed at intervals round the plantation, in order to warn their comrades of the approach of danger. The chosen animals then climb the fence with the greatest caution, and silently make their way into the orchard. As soon as they reach the trees they begin to pluck the fruit, handing it at once to the nearest companion. He passes it on to a third, the third to a fourth, and so on, all along the line, until it is deposited in safety in their rocky hiding-places. In this way a large orchard is rapidly stripped of its produce, when the baboons return to their retreats in order to feast upon their ill-gotten gains. In moving from place to place, the band is always placed under the command of experienced leaders, who issue their commands by means of short sharp barks. The flock is always drawn up in regular order upon the march, the young males being placed in the front, the females and the young in the centre, while the old experienced males bring up the rear.

The best known of all the baboons is the Chacma, which is very abundant in certain parts of Africa, and which, when fully grown, is about equal in size to a large mastiff dog. In spite of its savage nature,

it is often captured and tamed by the natives, who use it for a very singular purpose. In the vast deserts of Africa, where rain seldom falls, and where wells are only found at great distances apart, a supply of water is, of course, often very difficult to obtain. The chacma, however, possesses the strange power of detecting the presence of hidden springs, and is employed for the purpose of leading its captors to the spot. The operation is managed as follows. The animal is first deprived of water for a whole day, and its thirst increased by salt being placed in the mouth. A long cord is then fastened to it, and the animal allowed to wander where it will. Guided by various signs, known only to itself, it is almost certain to detect the presence of water should there be any in the neighbourhood, and will lead its captors to the longed-for spring, thereby, perhaps, saving the lives of many human beings. In their wild state also the baboons search for water in the same manner, digging away the earth by means of their fore-paws until the spring is reached. Should it be situated at any depth, the animals relieve one another at regular intervals until the work is completed.





5.—THE TRUE MONKEYS.



OW we come to the true monkeys, that is, those commonly known by no other name. They may be easily distinguished both from the apes and the baboons. From the former we may know them by the possession of both cheek-pouches and tails, neither of which are found in the apes. Then the arms are not so long as in those animals, and the whole form is more slender and better proportioned. The hinder feet, too, have very small thumbs, but are nearly twice as long as the hands. From the baboons we may know them by the position of the nostrils, which, you will remember, are placed in the baboons at the extremity of the muzzle, instead of upon the face just below the eyes. The form of the muzzle will also be of service in the distinction.

At every step we take downwards in the monkey family, we see that the animals gradually lose their

semi-human aspect, and assume the characters of the quadruped. The great apes approach, in many ways, closely to the human form, and are able to walk, although in a clumsy and ungainly manner, upon their hind-feet alone. The gibbons are also able to walk in this manner, while the baboons proceed almost entirely upon all-fours. In these latter animals, too, the change of frame is very apparent, the likeness to the human form being very much less than in the apes. In the monkeys themselves it almost disappears, while the erect position in walking is seldom or never assumed unless under training, just as a dog may be taught to walk on its hind legs.

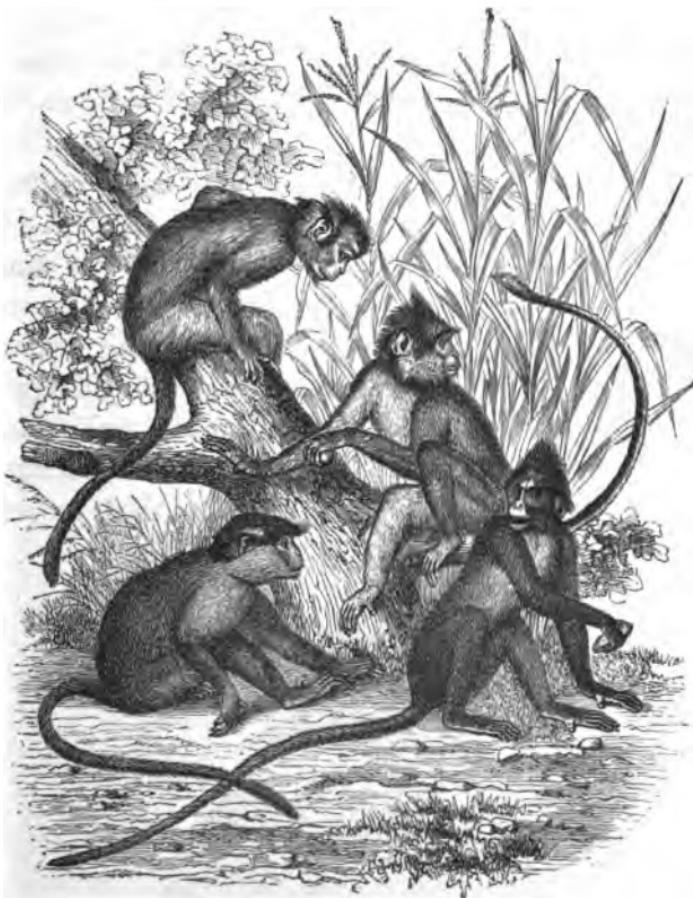
The best known, perhaps, of all the true monkeys is the Magot, or, as it is wrongly called, the Barbary ape. This is the only monkey found in any part of Europe, the famous rock of Gibraltar being tenanted by the animals in great numbers. It is not thought to be a native of Europe, however, but is supposed to have been introduced from Barbary, where it is found in abundance. The magot is one of the Macaque monkeys, which, you will remember, were mentioned in the lesson upon the baboons. Like those animals, it unites together in large flocks, each under the direction of appointed leaders, whose directions are given by means of short, snapping barks.

Another very well-known monkey is the Entellus, or Hunuman of India. (Pronounced Hoo-noo-man). Curiously enough, although it is a very destructive

animal, it is considered as sacred, and is carefully protected in consequence. Of course these monkeys soon find out that they are not interfered with, and grow more and more bold, infesting the streets of the towns and stealing every object to which they take a fancy. Yet, no matter what damage they do, no man is allowed to harm them.

Next we come to the monkeys of the New World, many of which, you will remember, are provided with tails, by the aid of which they can swing from a branch without needing to employ the paws. The last eight or nine inches of the tail are almost devoid of hair upon the upper surface, and completely so upon the lower. This naked extremity is endowed with so delicate a sense of touch that it can perform almost all the duties of the paw, fully deserving the title often applied to it of the "fifth hand." Indeed in some ways it is even more useful than a hand, as it can be inserted into crevices which the paws cannot enter, in order to hook out any desired object. These animals are generally called Spider monkeys, and are wonderfully active amongst the trees, travelling for miles upon miles without descending to the ground. Should a stream or small river interrupt their course, they pass over it in a most ingenious manner. A number of them form a bridge of their own bodies, upon which the rest of the band can cross. This they do as follows. First, one monkey clings tightly by his tail and hind paws to some lofty branch overhanging the stream, allowing his body to swing in the air. A

second monkey grasps him firmly round what is then the lower part of the body, and also hangs suspended. A third clings to the second, a fourth to the third,



MONKEYS.

and so on until a chain is completed of sufficient length to reach to the ground. The lowest monkey then pushes himself violently away from the earth, and causes the living chain to swing in the direction

of the opposite bank. As soon as a sufficient impulse is gained, he grasps a branch upon the opposite bank and gradually climbs higher and higher until he is at a sufficient distance from the ground, the rest of the chain thus forming a bridge across the stream. Upon this the remaining monkeys cross, without the need of wetting a single hair. Now, how are the monkeys composing the bridge to cross in their turn? Easily enough. Two or three powerful monkeys add themselves to the farther end of the bridge and climb as high as they can. The monkeys at the other end loosen their hold, so that the living bridge swings across the stream, the lower monkeys being dragged through the water while the upper ones make their way into the trees at once. The entire band, having thus successfully passed the obstacle, then proceed upon their way.



ANIMAL REPUBLICS.



IX.

ANIMAL REPUBLICS.

1.—THE BISON.



HY should some animals always herd together, while others, belonging to the same group, and indeed being near relatives, keep themselves aloof from each other?

Thus the rabbit is always found in company, while the hare is essentially a solitary animal. The bison of America is never found alone, and in former times counted the numbers of its herds by thousands. Yet the buffalo of South Africa and the arnee of India are comparatively solitary animals. So it is with the antelopes. The gazelle lives in small herds, while the number of a springbok herd rivals that of the bison in its best days. Yet in South Africa there are several species of antelope, such as the duykerbok, the rhoode-bok, the blue buck, and others, which are only to be found alone, or at the most in pairs.

I may mention that we find similar examples among the birds, such as the chaffinch, the starling, and the dunlin or ox-bird.

The wolves and jackals hunt in packs, while the fox, which is closely related to both these animals, hunts alone.

The same remarkable discrepancy is seen even among insects, particularly in the hymenoptera. There are social bees, wasps, hornets, and ants. Each of these groups has its solitary representatives, which in many cases so closely resemble their social relatives that none but a practised eye can distinguish the one from the other.

The desire for society, or as learned men call it, the gregarious instinct, is manifested in various ways. Some animals, such as those which have already been mentioned, are permanently gregarious, and are always in communication with each other. Some are only partly gregarious, and at distant intervals are subject to some strange instinct which compels them to associate together in countless myriads. Others again, although they have their dwellings in close proximity to each other, are only social out of doors, each family considering, like Englishmen, that their home is their castle. We will take a few examples of each of these types.

Chief among the permanently gregarious animals is, or rather was, the bison of North America (*Bison Americanus*).

Only a few years ago the bison blackened the

prairies with its countless multitudes. It formed the very life of the red man, just as the seal tribe are the life of the Eskimos of the present day. The tent or "wigwam" in which he lived was made of the skins of the bison stretched over a framework of poles, very much like the piles of hop-poles stacked for the winter. These simple dwellings could be erected in half an hour, and taken down in fifteen minutes.

Then, a pair of poles being fastened to each side of a horse, so that the ends trailed on the ground, the skins were tied across the poles, and upon the skins were placed the rest of the simple baggage. In this way a large encampment could be removed in a wonderfully short space of time, thus suiting the restless nature of a race which depended on hunting for livelihood.

The robes in which the natives enveloped themselves in cold weather were made of the skins of the bison. The Indians had the art of dressing the skin so that it was as pliable as silk, and, if wetted, could be dried without becoming hard and stiff, as is usually the case with leather. Sometimes the whole of the hair was removed, leaving the skin as white as vellum, only perfectly pliable. Such skins were only used by the great warrior chiefs, who took a pride in covering them with rude drawings illustrating the military achievements of the owner.

Again, the skins of the old bulls were reserved for the purpose of making the small circular shields

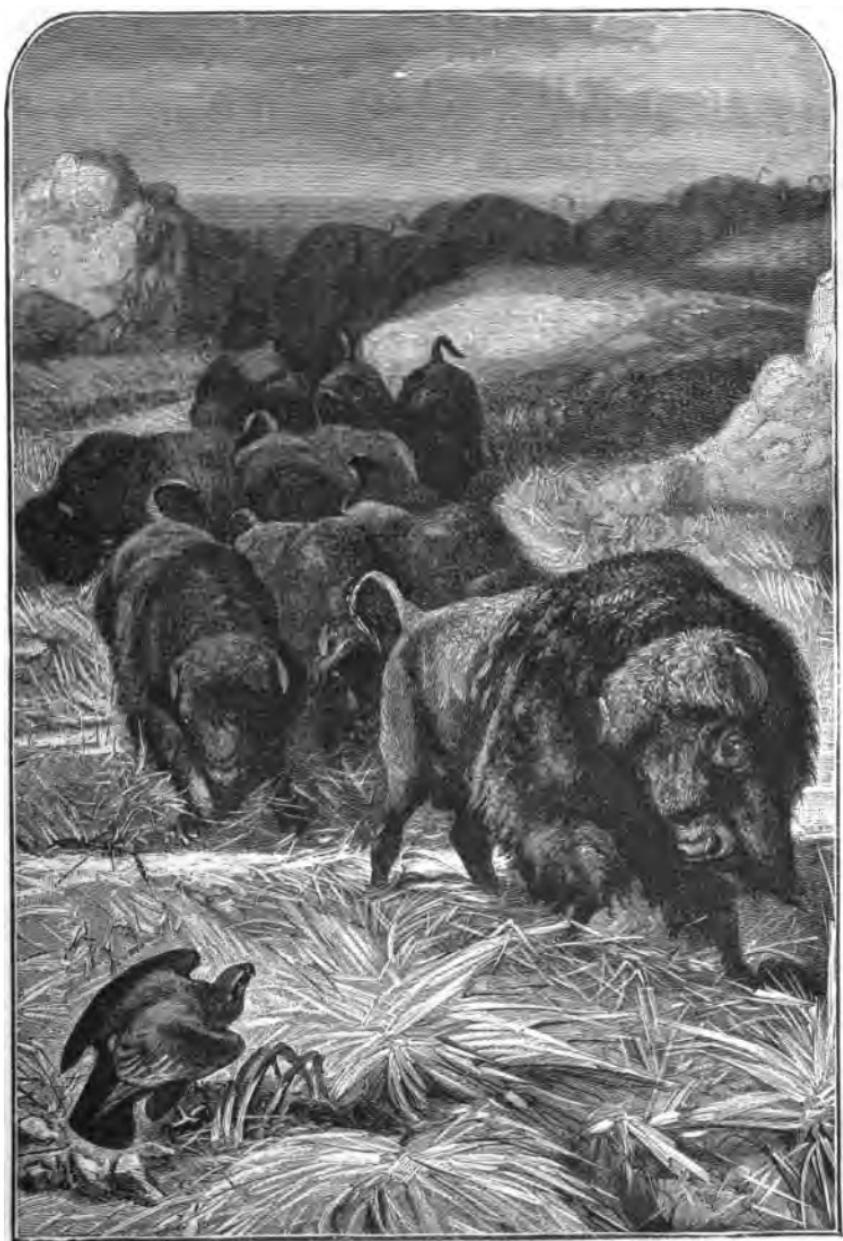
which form part of the equipments of a warrior. The shield is only two feet in diameter, and yet an entire bull's hide was used in making it. The hoofs were also required. The mode of making it is briefly as follows.

A circular hole is made in the ground, rather larger than the intended shield, and in it a fire is lighted. The hide, which has previously been deprived of its hair, is spread on the ground, and a circle traced on it, the centre being the apex of the shoulder, and the circumference being the edge of the hide. The rest of the skin and the hoofs are meanwhile boiled down into glue.

The future shield is then laid over the hole, and glue poured on it, the hide being kept in its place by a number of pegs driven into the ground round its edge. The heat and glue together cause the hide to contract, and as it does so the pegs are relaxed. This process goes on until the hide has contracted to half its width and twice its thickness. It is then trimmed round the edge, fitted with handles, and is complete. It will resist any arrow or spear, and will even turn a rifle bullet if it be struck at an angle.

The flesh of the bison was the chief sustenance of the red men. That which was not eaten fresh was "jerked," *i.e.* cut into long, thin strips, hung over branches and dried in the sun. The word "jerked" is a corruption of the native term "charqui."

Much of the jerked beef was made into "pemmican," a food which has the double advantage of keep-



BISONS ON THE MARCH.

ing good for any length of time, and comprising much nutriment in little bulk. The manufacture is simple enough. The dried meat is pounded until the fibres are separated, and the fat is then melted, and poured into it while boiling. It is then packed in bags made of hides, and preserved for future use. Our Arctic voyagers are obliged to depend largely on pemmican for their stores, though they use ordinary beef instead of charqui.

Civilisation has produced its usual effect on the bison, and the most deadly weapon of destruction is the locomotive. When the Pacific Railway was first established, one of the many obstacles which it had to overcome consisted of the bison herds. It is impossible to fence off such a railway, and in consequence the bisons took no notice of the rails, and frequently forced the driver to stop the train.

Another danger followed. At certain periods the bison herds take to migrating, passing from south to north, and in consequence crossing the rails. When a train passed through one of these migrating herds, the result was very remarkable. The bisons which had crossed the rails troubled themselves little about the train ; but those on the south flung themselves madly against the cars. Some of the bulls actually charged the engine, and in spite of the "cow-catcher," several trains were thrown off the rails.

Then came an utterly unforeseen incident. The signals did not work, and the whole system was thrown out of gear. The fact was that the bisons

had found a new use for the telegraphic poles ; they were excellent scratching posts, a luxury which the prairie does not afford, and the animals used them so vigorously that they soon broke the poles. Then the managers "protected" the poles by driving sharp spikes into them. They could not have made a greater mistake. They had not calculated on the toughness of a bison's hide. The animals were charmed with the spikes, and fought for the privilege of using them. By degrees, however, civilisation won the battle, and the bisons remained on the north of the line.

Only some fourteen or fifteen years ago, the numbers of the bisons were so great that even the incessant drain upon them by the red men, including the occasional raids when a herd of many thousands in number was decoyed to the brink of a precipice and then hurled into the valley beneath, made little impression on their countless multitudes.

But other agencies came into operation, and the land which had hitherto been the undisputed property of wild animals was needed for the cultivation of cereals, and so the bison found itself gradually edged out of its feeding grounds. Then came the regularly organized hunting parties, who took advantage of the fact that if a hunter can only hide himself when he fires, the herd take no alarm, but remain in their places, waiting to be shot.

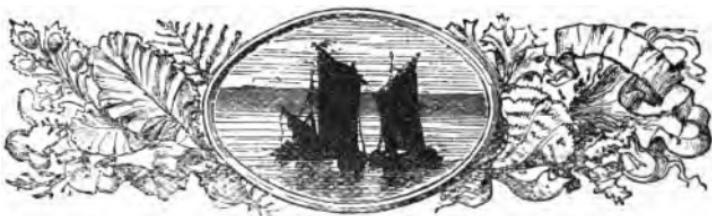
Each party consisted of but four men. There was the captain, who did all the shooting ; there were two skinners and one skin-dresser, who was also cook

and campkeeper. So skilled in the art of slaughtering did they become, that within a circle of two hundred yards' radius the captain of one of these gangs shot a hundred and twelve bison in three-quarters of an hour.

Within the years 1872—1874 no less than four and a half millions of bison were killed, more than three millions having been killed for the sake of their hides alone. So reckless and wasteful was the destruction that within a space of four acres no less than sixty-seven bodies were left to perish. At the present time it is believed that scarcely six hundred bison are left in the whole of America.

The natural results followed. The red men, finding their staff of life taken away from them, could no longer make a living on their own lands, and therefore made forays into the domains of the white man, and consequently were still more diminished in number. Then the wolves and coyotés, which used to feed on the old, sick, or wounded bison, began to attack the sheep and horned cattle, so that the conditions of life were entirely changed. The agents of the Smithsonian Institute, who were sent in search of specimens, were obliged to follow the animals into Montana, and from their account it is evident that in a very short time the bison will be as extinct as the great auk, the dodo, and the moa.





2.—ANTELOPES.

HANGE we our scene to South Africa, and let us in imagination stand with Gordon Cumming on the waggon, and watch the Springboks (*Antidorcas euchore*) marching on their migration. Active as may be the Springboks, they have no opportunity for displaying their activity when on the march. They are closely pressed together, and can only move at a slow walk.

On the first occasion when Gordon Cumming saw the migration, he beheld a solid column of the animals, at least half a mile in width, moving steadily onwards for more than two hours, during which time he was spell-bound by the astonishing sight.

Food is the main object of these migrations, inasmuch as the grass patches are few and far between, and the creatures which have to be fed are beyond the power of counting.

It would at first sight appear that nothing could

be less likely to feed such a multitude than the mode which is adopted by these antelopes ; yet the system is equally simple and efficacious.

When the herd arrives at pasture, it naturally follows that only the leaders can feed, as the animals are so tightly packed together that they cannot put their heads to the ground. Now, the antelopes are ruminants, and therefore when they have eaten their fill, they need to lie down and chew the cud.

This, however, is impossible, as the leaders are incessantly forced forward by the pressure of those behind them. They therefore when they have eaten their fill, turn aside out of the column, and lie down while their comrades pass them, and when they have finished the process of rumination, fall again into line at the rear. Thus, they all have their turn at feeding, the leaders always falling into the rear, and having to await their turn before they can make another meal.

The springbok seems to possess some instinctive power of discovering pasture, a trait which is turned to account by the Ba-Kalahari tribes.*

Just before the rainy season, they burn the dried-up grass of a limited district. As soon as the rain falls, a crop of sweet, fresh grass springs up luxuriantly, and is sure to be discovered by the springboks, whose flesh and fur are nearly as valuable to the natives as those of the bison to the red men.

I.e. the inhabitants of the great Kalahari Desert, north-west of the Orange River.

Another remarkable gregarious ruminant is also a native of Southern Africa. This is the Gnu (*Connochetes gnu*), an animal so singular in form and habits, that the earlier naturalists may well be pardoned for mistaking it for a horned horse, the thick mane and long tail adding to the resemblance. It also has a long beard and a tuft of hair on the nose. The generic name *Connochetes* is derived from the Greek, and signifies "beard-bearing."

The name of Gnu is given to it on account of its characteristic cry. The animal plants its feet firmly on the ground, and suddenly jerking up its head, gives a sharp yelp or bark, which pierces through all other sounds, and which, when once heard, cannot be mistaken. The word gnu, if spoken, or rather jerked out sharply, bears some resemblance to the cry.

It lives in herds, and being, like most antelopes, exceedingly swift of foot, might easily avoid all enemies. But it often falls a victim to its insatiable curiosity.

Any strange object serves to attract it, and, as is shown in the illustration, it cannot resist the temptation of inspecting the traveller's waggon, though experience might have taught it the dangerous character of the intruder.

If a herd of gnus be seen at a distance, the hunter can always decoy them within easy range. All he has to do is to lie on the ground, tie a piece of rag or handkerchief to a stick, and wave it about. The

615.



gnus seem fascinated by the strange object. They prance about, and wheel off, as if intending to fly out of sight. Then they wheel round, halt, and begin to approach the object of their curiosity. Occasionally they take a fancy to perform the strangest of antics, spinning round and round, prancing violently, and kicking up their heels, their white tails whirling round as if worked by a multiplying wheel. In consequence of these grotesque antics, the Boers call the gnu by the appropriate name of "wildebeest."

If the stick and handkerchief cannot be procured, the hunter can attract the gnu by simply lying on his back and kicking his legs in the air.

The flesh of the gnu is much valued by the natives, who also prepare from it a sort of "haggis," the blood, chopped liver, and other portions of the interior being stuffed into the stomach and then boiled.





3.—ELEPHANTS AND LEMMINGS.



OTH in Asia and Africa another gregarious animal is found. It is the largest of the terrestrial mammalia, and is familiar under the name of Elephant.

That the Asiatic and African animals are two distinct species is evident enough, the general form, the teeth, and the shape of the head being essentially different. The distinction between the two is very plainly shown by a longitudinal section of the skull, such as can be seen in the museum of the College of Surgeons. In their general habits, however, both species are so similar that we may treat them together.

They are essentially gregarious animals, a solitary elephant being never seen, unless it be a "rogue," *i.e.* one that has been turned out of the herd, and in consequence is at war with every living thing. Rogue elephants are the terror of travellers, for, as a rule, unless the traveller can kill the elephant, the elephant will kill the traveller.

ELEPHANTS.



The herds are not very large, and it is thought that all the elephants of a herd are related to each other. These herds are nearly as restless wanderers as the monkeys, and the presence of a herd in a certain spot is almost a proof that they will not be there on the morrow.

Awkward as they may seem, they are wonderfully active animals, being able to ascend and descend precipitous spots which require the utmost exertions of an active man. Their speed too is astonishing ; their long, silent strides carrying them rapidly for hours together over the country. They move by night, concealing themselves in the woods by day. It might seem difficult to conceal so huge an animal, but, in point of fact, an elephant among trees is almost invisible at three yards.

Not the least remarkable point about the elephant herds is their power of moving silently through the forest. Mr. W. T. Hornaday, chief taxidermist of the National Museum, U.S.A., has made some very interesting observations on these herds :—

“ I was really surprised at their sagacity and almost military manœuvring. We saw them deliberately,

“(1.) Reconnoitre dangerous ground by sending out scouts and spies.

“(2.) Communicate intelligence by signs or sign-language.

“(3.) Retreat in orderly silence from a lurking danger.

"(4.) March off in single file, like the jungle tribes of men.

"How different was this steady, noiseless retreat from the wild stampede which follows an open attack, in which the crashing and tearing through the jungle is at first appalling! This time the foe was in ambush when discovered, and the order signalled was, 'Retreat in silence and good order.'"

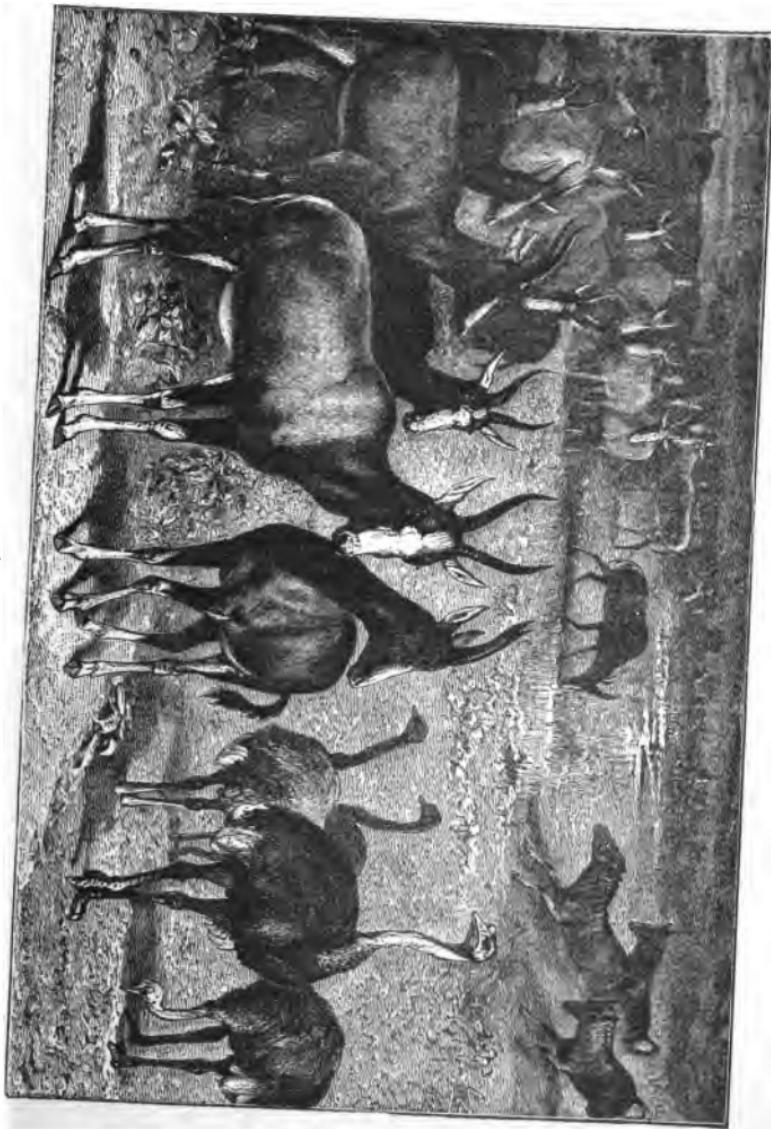
Here is an example of mixed gregariousness, such as, I believe, is only to be found in South Africa. Certain antelopes, the gnu being one of them, giraffes, ostriches, and zebras, are often found associating in one large herd. The Bontebok, or Pied Antelope (*Damalis pygarga*), as it is often called, is mostly to be found in these mixed herds. Its own herds are small, scarcely exceeding a dozen or so in number, but in one of these mixed assemblies a considerable number of these handsome antelopes can be found.

Lastly, we come to the creatures which only herd together on certain occasions. Their best type is the Lemming (*Myodes lemmus*).

This very remarkable rodent, a fine specimen of which is now before me, inhabits northern Europe, and, on some occasions, makes itself unpleasantly conspicuous.

At uncertain intervals, such as ten or fifteen years, the lemmings suddenly swarm, literally in millions, and begin to march southwards, devouring everything eatable. They press straight onwards, allowing nothing but a perpendicular wall to stop them.

A MIXED HERD.



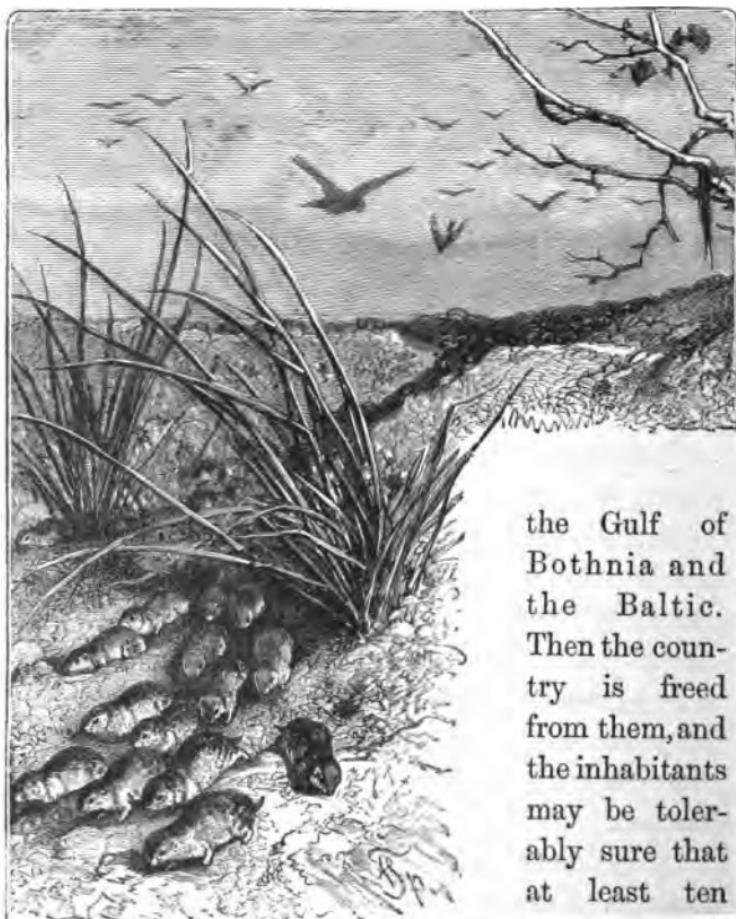
Even fire has but little effect upon them, the leading lemmings being forced into it by those behind until the fire is quenched by their numbers, and the dead bodies of the slain serve as bridges over which their comrades pass.

Not only do they eat all the herbage, but the people say that cattle refuse to feed on spots on which the lemmings have trod. Sometimes they come to a river, and enter it with the same stolid indifference which characterizes all their proceedings. As long as the water is quite smooth, they can swim fairly, and will succeed in crossing. But the least ripple is said to be fatal to them.

Predaceous beasts, such as wolves, foxes, wild cats, stoats, &c., accompany them, and feed luxuriously on them. So do predaceous birds, such as eagles, hawks, and owls; and even the largest fish are their enemies, snapping them up as they are endeavouring to cross the rivers. Fear is utterly unknown to them, probably by reason of their want of intellect, and although they will not go out of their way to attack any one, they entirely decline to make way for even man himself.

They move in two vast columns, one passing through Norway and the other through Sweden. The end of them is always the same ; and supposing that they have escaped the beasts, birds, and fishes, and have surmounted the perils of fire and water, they are forced into the sea and perish there. Those which take the route through Norway are

forced into the Skager-rack and Kattegat ; while those which pass through Sweden lose their lives in



LEMMINGS.

the Gulf of Bothnia and the Baltic. Then the country is freed from them, and the inhabitants may be tolerably sure that at least ten years must elapse before

the lemmings can increase sufficiently to make up for the terrible losses which their migration has cost them.

These strange proceedings of the lemmings appear at first sight entirely unaccountable. But a very curious and interesting explanation has been suggested, which seems not improbable. Long ages ago it is certain that solid land occupied the whole area of the German Ocean. Sweden also was connected with Russia and East Prussia. In those prehistoric times the lemmings, when their numbers increased too greatly for their scant feeding grounds, would set out south-westward and south-eastward towards the lands then directly bordering on what is now the Scandinavian peninsula. Here the herds were scattered in search of food. Then came the changes of level which admitted the ocean to the present shallow seas of the north. But the lemmings still persisted in their old habits. They had not sense enough to adapt their customs to altered circumstances; and so they continue to drown themselves in sturdy faithfulness to the manners and customs of their ancestors. Perhaps higher races might learn a lesson from their fate.

There is one little set-off against the damage done by the lemmings. They are very good to eat, and lemming cooked like quail and served on toast, is considered to be quite a dainty. They are very small to do so much damage, being scarcely six inches in length.



ANOMALOUS ANIMALS.



X.

ANOMALOUS ANIMALS.

1.—THE GIRAFFE.

WE have become so familiar with the outward forms of the more important animals, that we are apt to forget the interest which attaches itself to their mode of life. I have therefore gathered together a few well-known mammals for the sake of pointing out some of the peculiarities—we may almost call them anomalies—of their structure and biography.

Take, for example, that very conspicuous animal, the Giraffe (*Camelopardalis giraffa*).

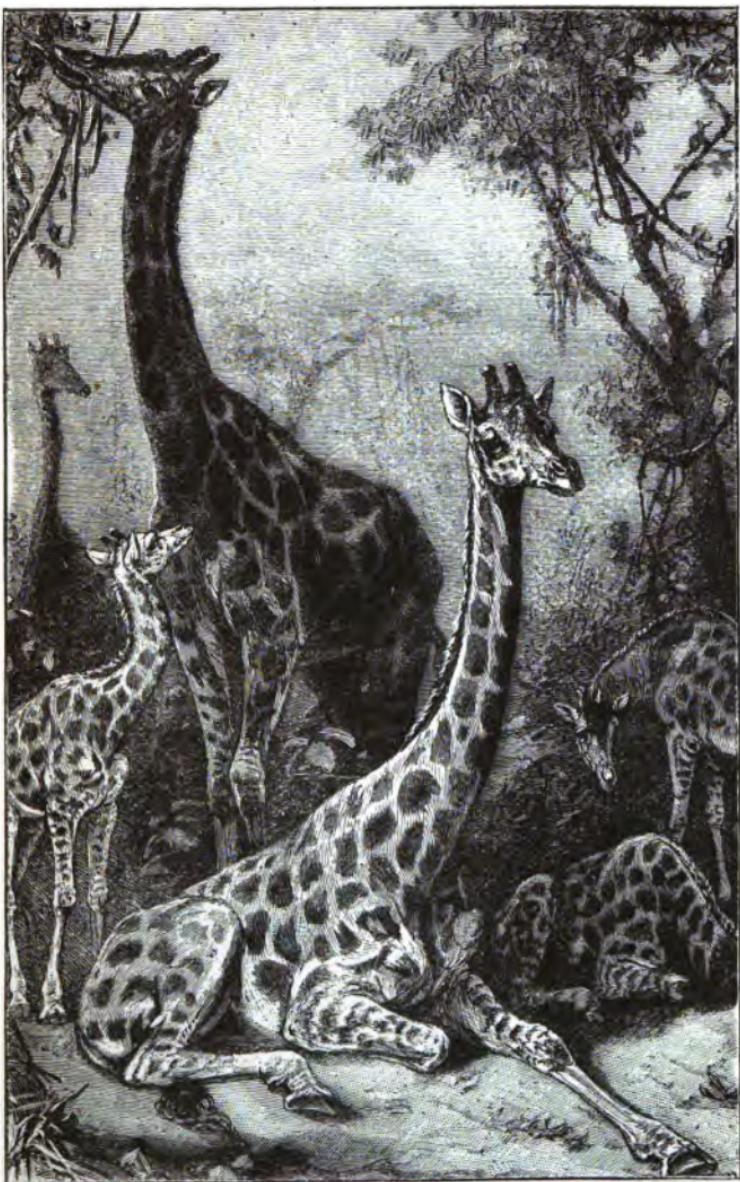
Considering that almost every child in the kingdom is familiar with the appearance of the giraffe, and that not even a “Noah’s Ark” is held to be complete without a pair of giraffes, it really seems wonderful that scarcely more than a century ago the animal was absolutely unknown in England. The

ancient Romans not only knew it, but exhibited it at their public games. Long before the Roman empire was founded, the Egyptians knew it, as is shown by the sculptures upon their ancient monuments.

Its home is in various parts of Africa, so that it has been accessible to European travellers for some centuries. Yet, the knowledge of the giraffe had so utterly faded from Europe, that when Bruce re-discovered the animal and described it, he was met with a storm of ridicule which to us of the present day seems almost incredible.

It was said to be impossible that any animal could have so long a neck without overbalancing itself. It was impossible that a mammal could have three horns, one at each side of the head, and the other in the middle. If Bruce had restricted himself to two horns, people might have believed the neck (with some allowance for travellers' exaggerations), but the third horn discredited the whole of the pretended discovery.

It is true that the structure of the horns is quite anomalous, so that the objectors had some reason on their side. The so-called "horns" are not hollow growths of the epidermis supported on bony cores, like those of the oxen, antelopes, and other hollow-horned ruminants. Neither are they bony growths upon the skull, like the horns, or more properly the antlers, of the deer tribe. They are short bony processes, set on very short footstalks, and covered with



GIRAFFES.

skin. The longer horns of the sides have a tuft of black hair at their tip, while the short central horn is hairless.

Another anomalous structure is the neck, at which so much umbrage was taken. In spite of its enormous length, it only possesses the seven vertebræ which are common to nearly all the mammals. In consequence, it is nearly as inflexible as a wooden bar of equal length, so that the many pretty pictures which represent giraffes curving their necks gracefully, after the manner of swans, are ludicrously wrong.

"But," said the objectors, "if it had so long and inflexible a neck it could not graze, and being a ruminant animal, would die of hunger."

It is quite true that it cannot graze. It can only lower its head near the ground by spreading its forelegs as widely as possible and drawing its hind legs under them, thus presenting a most ludicrous aspect. In its native state it never, as far as I know, even attempts to lower its head to the ground, but in captivity it can be induced to do so by laying on the ground a large lump of sugar, of which it is inordinately fond.

The fact is, that it is intended to graze, not on the ground, but on the leaves of trees. The acacia, or mimosa, is its favourite tree, and the Dutch colonists have in consequence called the acacia by the name of "*kameeldorn*," i.e. camel-thorn, as they invariably give the name of "camel" to the giraffe.

This mode of feeding involves another anomalous structure. This is the tongue, on which the giraffe is almost as much dependent as is the elephant on its proboscis.

It is possessed of wonderful powers of extension and contraction, and can be narrowed until it almost resembles the corresponding organ of the ant-eater. The peculiar powers of the tongue can well be seen when the animal takes the sugar from the ground. It does not attempt to seize the sugar with its lips, but protrudes its tongue to its fullest extent, twists the narrowed tip round the sugar, and so draws the coveted dainty into its mouth. When it feeds on the trees, it picks off leaf after leaf quite daintily, selecting those which are most to its taste.

Except when it consorts with other animals in the mixed herds which I described in a previous chapter, it lives in small companies, such as may be seen by reference to the illustration.

Being such large and conspicuous animals, the males attaining a height of some eighteen feet, and their skins being covered with boldly marked patches of deep chestnut brown upon a whitish ground, it might readily be imagined that they must be easily discoverable, even at a distance. But, in point of fact, not even the elephant is less easy of detection.

The acacias on which the giraffe feeds do not grow in forests such as the elephant loves, but in small clumps, each containing only a few trees. In one of these clumps half-a-dozen giraffes may be

reposing, and yet, even the sharp-eyed native hunters can seldom pronounce whether or not the clump is tenanted.

The fact is, that the long neck and legs of the giraffe harmonize so exactly with the trunks of the mimosa, that, at a little distance, it is absolutely impossible to distinguish the tree from the animal. Then, the large dark spots upon the light ground so closely resemble the patches of light and shade thrown by the sun's rays from the peculiar foliage of the mimosa, that instead of making the animal conspicuous, they have the effect of rendering it almost invisible as long as it remains under the shadow of the branches.

Except that it moves the legs of each side alternately, its walk has nothing remarkable about it. But, when alarmed, and flying for its life, its gestures are as anomalous as its form. It gallops in a series of jumps which have been compared to the hops of a frog, its long, straight neck rocks up and down, and its tail is jerked backwards and forwards with such force that the hair tuft at its tip makes a hissing sound as it is swished through the air.

In spite of the grotesque and apparently awkward movements, the pace is very swift upon broken ground, but on a level, a fairly good horse can overtake the animal. The gallop of the giraffe has never been witnessed in this country, although a specimen was brought to England in 1836, and the animal has bred freely for the last forty years.



2.—THE HIPPOPOTAMUS AND WHALES.



NHABITING the same country as the giraffe, is an animal which is in every way its opposite, and well deserves a place among the anomalies. This is the Hippopotamus, or Zee-koe, *i.e.* Sea-cow, as it is termed by the Dutch settlers (*Hippopotamus amphibius*).

Instead of living wholly on land, it passes almost the whole of its time in the water. Instead of daintily plucking the leaves of trees one by one, it feeds hugely on grass and other herbage, almost shovelling its food into its vast jaws. Instead of possessing a long neck which reaches to the branches of trees, it has a neck so thick and short that, like that of the whale, it is almost merged into the body.

Its skin, instead of being clothed with a coating of beautifully mottled fur, is quite bare and oily. Its legs are as short in proportion as those of the giraffe

are long, and, instead of being swift of foot, and galloping with the odd jumps which have already been described, it is slow and clumsy on land, though swift and powerful in the water, which the giraffe never enters.

Now let us examine the hippopotamus in detail, in order to see where it differs from other animals, and deserves the title of anomalous.

Beginning with the exterior, the skin is of enormous thickness and toughness. From it are made the terrible whips called "sjamboks," a stroke of which will make a groove in a deal board. A large sjambok affords the only argument to which a native draught-ox will listen, and a smaller instrument, called familiarly a "cowhide," is used in lieu of our riding whips.

As the hippopotamus spends so much time in the water, the skin is perforated with a number of pores, through which exudes a thick, dark, oily secretion, which like the fur of the seal, otter, beaver, and other aquatic animals, keeps the creature dry, even when it is submerged.

When, in July, 1849, "Obaysh," the first hippopotamus ever brought to England, was taken in the Nile as a youngster, its slippery skin enabled it to wriggle out of the arms of its captor, and it was only secured by driving a boathook into its hide, the scar remaining through the rest of its long life. When, in May of the following year, it arrived in London, I went to see it, and inadvertently patted it, not know-

ing of the oily secretion. Consequently, a pair of new kid gloves which I was wearing were utterly spoiled. A female was afterwards obtained, and in 1871 was born the first hippopotamus ever produced in Europe. As its mother did not know how to manage it, the young calf was taken away and fed artificially. Taking it from its mother was a most perilous task, and, after a most exciting series of adventures, was achieved by Scott, the man who was afterwards so well known as "Jumbo's" keeper. The little creature weighed about a hundred pounds, but kicked and screamed like an adult, while its round, smooth body was so oily that Scott could scarcely hold it.

Now let us examine the head.

The eyes, ears, and nostrils are set nearly on the same plane, so that the animal can sink itself entirely below the surface, and be able to perceive the approach of foes by hearing, sight, and scent.

When it lies motionless and dozing in the water, it is naturally a little lighter than a corresponding bulk of water, and so floats with only a little of the back, and the ears, eyes, and nostrils above the surface. But it often has to sink in order to pass for some distance under water. This necessity involves several other peculiarities of structure.

In order to enable it to sink, it is able to contract its body, so as to make it rather heavier than a corresponding bulk of fresh water, and when it wishes to rise, all it has to do is to relax the contracting

HIPPOROMA.



muscles, and allow its body to resume its former dimensions. Then, both the ears and the nostrils can be closed as soon as the animal sinks, so as to prevent the water from getting into them.

Now come the jaws and teeth.

In order to enable the animal to take into its jaws the enormous masses of herbage which it consumes,



THE SPERM WHALE.

the mouth has a vast gape, reaching nearly to the eyes. The teeth more than match the jaws, the front teeth acting like the blades of a mowing-machine, and the hinder teeth, or molars, serving as grindstones.

The incisor teeth of the lower jaw project forwards, while the canine teeth, or tusks, are curved upwards, like those of the boar, their tips being bevelled like

those of the rodents. The tusks are of enormous size, sometimes weighing as much as eight pounds. Those on the upper jaw are formed on the same pattern, but are shorter. The teeth furnish a peculiarly hard and white ivory which does not turn yellow like ordinary ivory, and, in consequence, is largely used in the manufacture of artificial teeth.

As we are not engaged upon the biography of the animals, but are only concerned with certain portions of their structure and life-history, we will now leave the hippopotamus and proceed to another anomalous mammal.

All the whales, dolphins, and porpoises are so far abnormal animals, in that they are mammals which pass the whole of their life in water, are destitute of hind limbs, and never even repose themselves on ice after the manner of the seals.

All the cetacea are anomalous animals, inasmuch as, being mammals, they must breathe atmospheric air by lungs, and yet must be able to support existence for a considerable time without access to air. Some of the whales, for example, can remain below the surface for more than an hour, and yet will not be drowned. They owe this power to an internal reservoir of blood, which can be let into the circulation when wanted. It varies in dimensions according to the needs of the animal, but the principle is the same in all. This supplementary supply of blood is aerated by the peculiar respirations which go by the popular names of "blowings" or

NARWHALS.



"spoutings," which are so characteristic of the whale tribe.

One of the dolphins, the celebrated Narwhal (*Monodon monoceros*), is doubly anomalous.

Possessing the peculiar structure and habits which have been mentioned, it also has a most anomalous development of the canine teeth. In the male the left canine tooth of the upper jaw is enormously developed, being indeed the longest tooth possessed by any of the mammalia. It is quite straight, projecting almost directly in front of the animal, tapering gradually from base to tip, and is spirally grooved throughout its length.

It derives a peculiar interest from its almost historical position as being apparently the model for the "horn" of the fabulous unicorn of which so many strange legends were told and believed, and which for some centuries has been one of the supporters of the royal arms of England.

In a few instances the right tusk is developed instead of the left, and now and then both tusks project from the jaw. In such cases one is mostly shorter than the other; but in the Hull Museum there is a fine narwhal with two full-growth tusks of equal length.

The average length of the narwhal is thirteen or fourteen feet, and a fine tusk measures about seven feet from base to tip when removed from the animal.

This remarkable creature inhabits the northern seas, and is occasionally taken off our shores.



3.—THE BEAVER.



ERE is another animal which may well be included in the present series.

The Beaver (*Castor fiber*) once enjoyed a very wide range of territory, being spread over nearly the whole of Europe, including the British Islands, many parts of Asia, and a large tract of North America. It has long been extinct in this country, and in Europe, with the exception of the Rhone district it is mostly confined to Russia and the more northern regions. In Asia it is still found in Siberia, and in North America it flourishes at the present time.

In the Rhone the Beaver is still plentiful, and in February, 1886, a specimen was taken which weighed twenty-four pounds. Indeed, it appears to be rather too plentiful, for the Highways and Bridges Department has been obliged to offer a bounty for its destruction, on account of its habit of injuring the banks of the river by its burrows.

The European and Asiatic beavers differ somewhat from their American relatives, and as the latter have retained their wonderful instincts in great perfection, being far removed from the neighbourhood of man, we will take them as our subject.

The beaver is equally at home in the water and on land, and therefore requires certain modifications of structure. The nostrils can be closed while the animal is submerged, and a portion of the external ear is so constructed that it can be pressed to the head so as to exclude water.

Swimming is conducted entirely by the hind feet, which are webbed as far as the claws, the fore feet being reserved for other purposes. When, for example, the beaver brings materials by water, it holds them between the fore paws and the chin, and even on land it has been observed to carry snow in the same manner. The popular idea that the beaver carries mud on its flat tail, and then uses the same organ as a trowel, is entirely unfounded.

It is a good burrower, using its fore paws for this purpose ; and as a builder, it is unrivalled among the mammalia. It exercises its architectural powers in two ways.

Wherever it may live it must build a house, or "lodge," as it is generally called. The lodge is shaped very much like a Zulu hut, circular and dome-shaped. But, as the beaver lives in cold climates, and is moreover exposed to the attacks of powerful enemies, its house is very much stronger

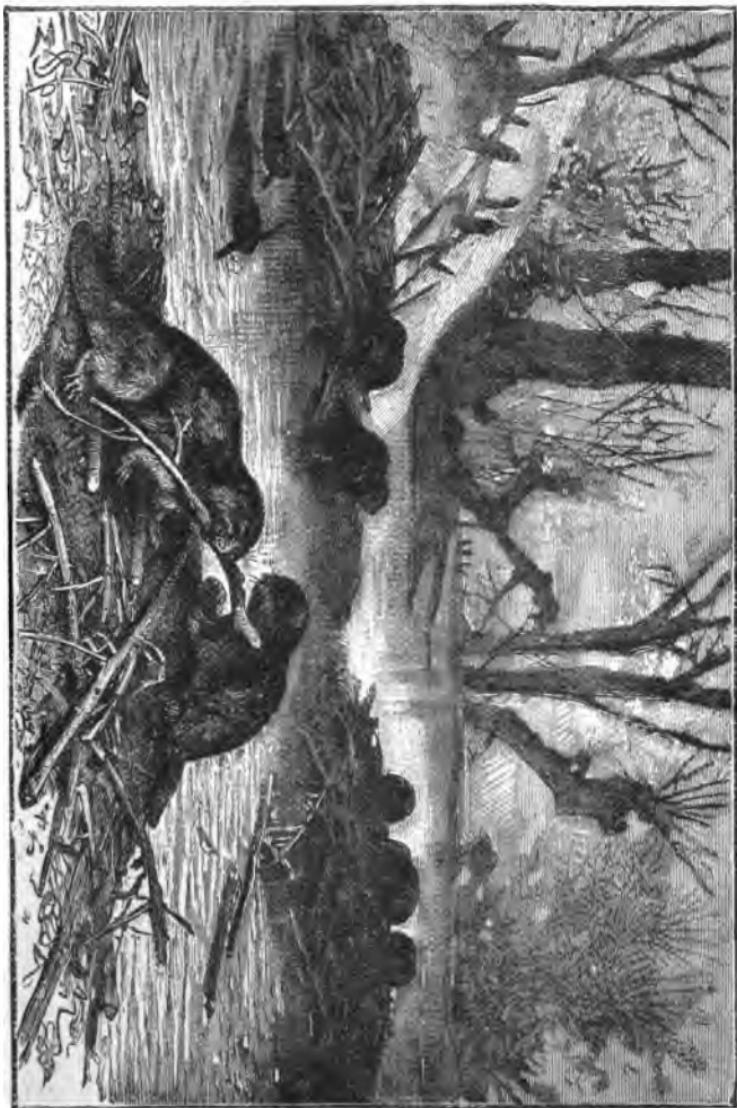
than the flimsy basket-work of the Zulu, and is much more complicated in detail.

It is always placed on the bank of a stream, and measures externally about fifteen or even twenty feet in diameter, and six or eight feet in height. The walls, however, are so thick that the internal diameter is only some seven feet, and the height three feet. It is made of logs and branches of trees, thickly plastered with mud.

Just before winter sets in, the beaver lays an additional coat of mud on the exterior. During the severe winters of North America, where I have personally known the temperature to be as low as forty degrees below zero, the mud is frozen into stony hardness, and can repel the attacks of even the wolverene or glutton, the beaver's worst enemy. A ditch always surrounds the lodge, and there is invariably an internal communication with the stream on which the lodge is built.

The wood which is employed by these animals serves a double purpose. They feed upon the bark, peeling it from the tree, and storing large quantities under water for future use. The remaining wood is not wasted, but is employed for building purposes. Sometimes the stream on which the beaver lives is too small to serve the purposes of the animal, or is liable to be dried up in an exceptionally long and hot summer. In those cases the beaver is taught by instinct to construct a dam for the purpose of banking up the water, so as to insure a permanent supply.

BEAVERS AT WORK.



Some of these wonderful pieces of animal engineering are more than a hundred yards in length, and lay many acres under water.

The materials are the same as those which are used for the lodge, but the lowermost logs are of greater size. In order to obtain a supply of wood for this purpose, the beaver will fell trees of considerable size, sitting up on its hind legs and nibbling the tree all round, until it resembles an hour-glass. The tree is sure to fall, and in like manner be cut up into convenient lengths. Stones, mud, and small branches are used together with the logs, and by degrees a strong dam is formed, its width at the bottom being from twelve to twenty feet, and at the top from a yard to five feet or so.

After a dam has been in existence for some years, fallen leaves, river weeds, and similar floating *débris* lodge upon the dam, and produce a kind of soil. Seeds of various kinds, and sometimes those of trees, fall into this soil and spring up, their roots entwining themselves among the logs and branches, and binding them firmly together. Even if the whole colony has been destroyed, the dams remain, and thus exercise a considerable influence on the character of the locality. Places where the beaver has removed the trees are popularly called "beaver clearings."

I need scarcely say that the beaver cannot drive stakes into the ground, and then twist branches among them, as has often been said and even figured.

It simply lays the materials, leaving them to settle by their own weight.

The last abnormal particular which can be noticed is the "castoreum," a remarkable secretion produced by the male, and analogous to the well-known civet and musk. It was at one time much valued as a medicine, but has now quite dropped out of the pharmacopœia.

It possesses a powerful odour, which has a wonderful effect upon all male beavers within its range. They rise on their hind legs, squeal with excitement, and make for it as fast as they can.

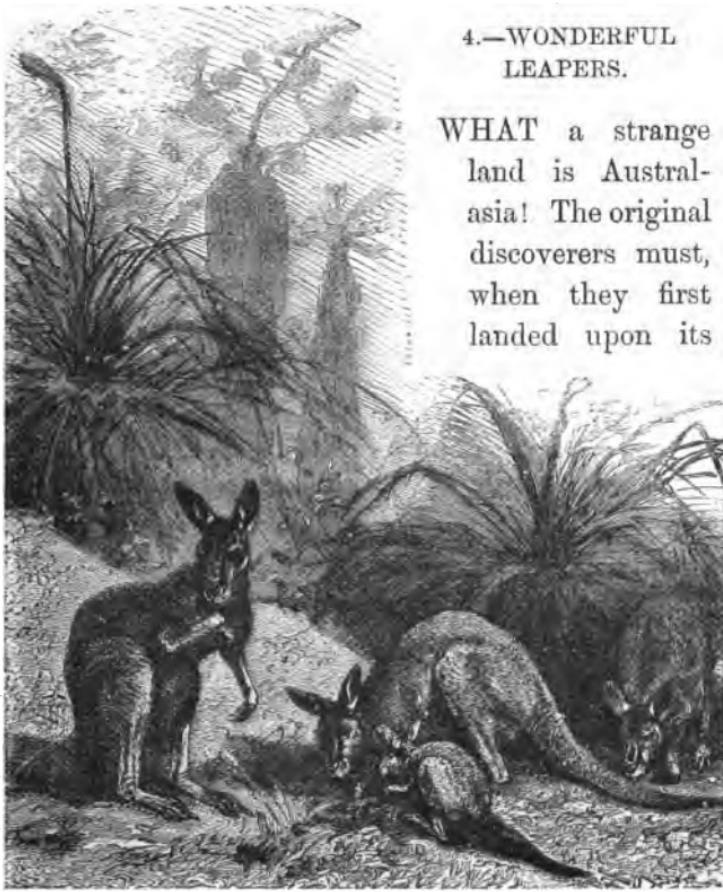
The trappers make a singular use of this propensity. They keep by them a tightly-closed vessel containing castoreum, and a number of slender twigs. They set their traps so as to be covered by about six inches of water. Then they chew one end of a twig so as to make it into a sort of brush, and dip it in the castoreum. They then set the twig in such a manner that the brush projects for a few inches from the water, just above the trap.

This simple bait will attract any but an old and experienced beaver. These creatures, however, are as wily as old rats, and when one of them comes to a castoreum bait, it fetches a quantity of stones and mud, drops them on the trap until it has raised a mound above the surface of the water, and then goes away, having rendered the trap useless. Before leaving the spot it always deposits some of its own castoreum on the mound which it has raised.



4.—WONDERFUL LEAPERS.

WHAT a strange land is Australasia! The original discoverers must, when they first landed upon its



KANGAROOS.

shores, have almost thought that they had found a new world. Look, for example, upon the scene which is depicted in illustration, and you will note that such a tableau is absolutely without parallel in any other part of the world. The vegetation is, to our eyes, as fantastic as that of the Vrilya in Lord Lytton's "Coming Race." Putting aside other strange vegetation, there are trees whose outline is exactly that of huge carrots, with a tuft of branches taking the place of leaves. Then there are clumps of "black-boy" grass, so called because the drooping blades and central stem closely resemble at a little distance a native sitting crouched on the ground, with his spear held upright.

But the strangest point in the country (or continent, as it may fairly be called) is the fact that all the aboriginal animals are marsupials, or pouch-bearers. Only one group of marsupials—the opossums—has survived in any other part of the world: but in Australia a pouchless animal would be as great an anomaly as a marsupial in England.

I need scarcely explain that when the young of the marsupialia are born they are of exceedingly minute dimensions, quite incapable of coping with the many trials of the world. They are therefore transferred to a pouch, or "marsupium," which is formed by a fold in the skin of the abdomen, and there they remain until they are strong enough to get their own living.

As this pouch has to bear a considerable weight,

especially when the young are nearly large enough to lead an independent life, it is supported by two bones that project from the front of the pelvis. These bones are, in fact, ossified tendons, and it is a remarkable fact that they exist even in the male, although he, of course, needs no pouch. They are also found in the duck-bill, which not only has no pouch, but actually lays eggs like a bird.

Several of these marsupials, especially the petaurists, bear a close resemblance to certain animals of the Old World, and in consequence, when English colonists began to oust the natives and settle in the country, they bestowed on most of the animals the names of those creatures with which they were familiar. So we find, according to that very accommodating nomenclature, badgers, cats, wolves, mice, rats, squirrels, monkeys, and bears.

Fortunately there was one animal for which they could find no analogy, and therefore retained its own name of "Kangaroo" (*Macropus*). This is, moreover, a typical example of the marsupials, and has therefore been placed in our present group of phases of animal life. There are many species of kangaroo, and I shall therefore only give a few lines to the Great Kangaroo (*Macropus major*), the adult male of which is popularly called the "Old Man," or "Boomer."

It attains very large dimensions, a hundred and sixty pounds being the average weight of a fine specimen, and its total length between seven and eight

feet. Its mode of progress is peculiar, though not unique, as it is paralleled by the jerboas of the Old World and all the hopping birds.

The fore legs are very small, being seldom used for progression, and, in fact, acting the part of hands, as we see in the squirrel and other rodents. The normal mode of progression is by leaps, sometimes only extending for a few inches, but, when the animal is fleeing from an enemy, covering several yards. On one occasion the tracks of a hunted boomer were measured, and each leap was found to cover "just fifteen feet, and as regular as if they had been stepped by a sergeant." One of these animals ran for eighteen miles and swam two miles, the entire chase occupying about two hours.

On level ground high-bred horses and dogs in full training can be tolerably sure of running down a kangaroo; but if the animal can make its way to broken and rocky ground, especially where the trunks of fallen trees beset the track, it can mostly make good its escape.

When brought to bay it is as formidable an antagonist as the stag itself. It has no horns, but it has hind feet, and at the tip of the fourth toe there is a claw of great length, shaped like a bayonet, and scarcely less formidable. A single kick from this weapon will rip up a dog as if the animal had been struck with a sharp sword, and even an armed man does not like to approach it in front.

Generally, when at bay, the kangaroo stands up-

right, resting its back against a tree, so that the dogs cannot attack it from behind. The hunter, however, takes advantage of this habit. He trains his dogs to make false attacks on the animal in front, without coming within range of the terrible claw ; and while its attention is engaged in front he slips behind the tree and strikes his long hunting-knife into the body of the kangaroo.

Not many years ago the kangaroo swarmed like the bison in America. But now great cities have sprung into existence, where, scarcely fifty years ago, not even a hut was to be seen, and the black men and the kangaroo were masters of the land. The time is not very far distant when sheep and cattle will have taken the place of the kangaroo, and Australia will only know her most characteristic animal by reputation. The kangaroo and the bison will alike fall victims to advancing civilisation.

The kangaroo is not thought to be a very intellectual or affectionate animal. But, towards the end of 1886, the kangaroo showed itself in an unexpected light.

A number of these animals were sent from Australia to Philadelphia, United States of America, *via* Liverpool. There they were transhipped into two vessels bound for America, as no single ship could accommodate the fifteen large cages. Among them were a pair called "Jack" and "Flora." Unfortunately they were separated at Liverpool, much to the sorrow of Flora, who continually called for her mate, and could

not be induced to take her food for some days. On the voyage two little ones were born, or rather grew sufficiently to poke their heads out of their mother's pouch.

Now we will quote the account of an eye-witness : “The ship bearing Flora was the first to arrive, and the batch of kangaroos were at once sent to Philadelphia. The other load of kangaroos arrived at Philadelphia a week later. Flora seemed to scent the coming of her mate, and when the cage containing him was carried into the museum, he heard Flora’s voice and answered her. Flora’s joy knew no bounds, and she leaped about her cage in the wildest excitement, ever and anon stopping to gaze out from behind the bars to see if Jack had come. The keeper, to prevent Flora from injuring herself against the bars of her cage, was obliged to bring her mate up-stairs and put him in her cage.

“Never was a more impressive scene enacted between two animals. They embraced, licked each other, and rubbed their noses in expression of affection, forgetting all about their babes. Finally, the father saw them and tenderly licked their faces, while the little things hopped from their mother’s pouch, as if to extend to him a friendly greeting. Jack, Flora, and the two babes are now the happiest animals in the world, and the keeper vows that he will never separate them again.”

Here is an animal which has a peculiar interest for us. This is the Ibex (*Capra ibex*), sometimes called



the Steinbok,
i.e. Stonebuck (occasionally given at a fuller length as Bergsteinbok, *i.e.* Mountain Stonebuck). It is also known by the name of Bouquetin. All the ruminant animals which



STONE-BUCKS.

we have hitherto noticed have been the inhabitants of the plains, but, as its German name imports, it is essentially a denizen of the mountains, and, like the chamois, owes its very existence to its surefootedness on precipices which man, with all his appliances, can scarcely surmount.

It lives in little bands, seldom exceeding six or seven in number, and being under the leadership of one experienced male. One of these bands is represented in the illustration as descending from their rocky fastness, the leader being in front, and alert to detect danger.

The adult male can at once be distinguished by the enormous size of his horns, which, in an old specimen, are sometimes so large that they almost appear to overbalance the animal. Formerly it was thought that when the ibex was closely pressed by hunters, it could leap off a precipice head downwards, break its fall by means of its elastic horns, and make its way off in safety. But, inasmuch as the females would just as much need to escape the hunters as the males, and yet do not possess these "buffers," it is very evident that they are simply a masculine ornament and weapon.

Those who have seen them in their almost inaccessible retreats say that their activity is almost incredible, the animals flinging themselves against the face of an almost perpendicular and apparently smooth precipice, which looks as if it could afford no more footing than a brick wall, and by a succession

of bounds from imperceptible irregularities, reaching the summit with perfect security.

It has rather a wide range of territory, being found in the alpine regions of Asia and Europe. The Asiatic specimens are, as a rule, larger than the European. Its special interest to ourselves consists in the fact that it is almost certainly the stock from which our domestic goat has been derived.





5.—MISCELLANEOUS ITEMS.



N the frontispiece to this volume we have a group of animals which are so familiar that few of us realise what wonderful beings they are.

Among sportsmen a Stag is valued according to the number of projections, or "tines," upon its horns, or antlers, as they ought properly to be called. Yet how few of those who follow the staghounds trouble themselves about the extraordinary character of the antlers by which they know whether or not a stag may be hunted! Were they permanent, like those of cattle, goats, and sheep, there would be little wonderful about them. But every set of antlers falls off in the spring, and however large and complicated it may be, is replaced by a fresh set in the following autumn. Let us follow a set of antlers through their growth, and suppose them to belong to an adult stag at least six years old.

In February the antlers fall off, and hardly have they been shed, when nature at once takes measures for replacing them.

At the spots on which the former horns had rested, a round knob begins to grow, covered with a peculiar skin, which, from its rough exterior, goes by the popular name of "velvet."



This velvet is filled with arteries and veins, and from its interior surface the horn is secreted. The horn is, in fact, bony matter, having a much denser consistency than the bones of the limbs.

The velvet grows with wonderful rapidity, and on account of the great volume of blood which is forced into it, is extremely hot to the touch. It is also amply supplied with nerves, so that it is extremely sensitive. Here is another beautiful provision of nature. If the velvet be injured, the growth of the horn is hindered, and therefore the stag is warned by the sense of pain not to strike its budding horn against any hard substance. Consequently, as long as the velvet is on the horns, the animal can be approached with safety. In fact, it is in very much the same condition as a lobster which has lately cast its shell and is only clad with soft integument.

About September the horns have attained their full development, and must be freed from the velvet. This is done in a very simple manner. The horns having reached their complete form, no more bony matter is needed for them, and it is accordingly deposited at the base, where it forms a thick, bony ring, called technically the "burr." As the burr increases in size, it encircles the blood vessels and gradually diminishes their diameter, until at last it cuts off the supply of blood altogether.

Before the burr has done its work, the velvet would bleed copiously if it were wounded. Now, however, the supply of blood being stopped, the velvet begins to shrink and become dry, and can be rubbed off against the trees. At this period, a stag is anything but a pleasing object, the still bleeding velvet hanging in strips from the horns.

What a wonderful chemistry is that of nature, which, from mere grass-blades can extract sufficient bony matter, not only for the skeleton, but for the weighty antlers! In the great Irish elk, now only known in a fossil state, the horns actually weighed more than the whole of the skeleton, and yet were annually renewed. "All flesh is grass," and so is all bone.



IN SEPTEMBER.

Not until its sixth year does the stag attain its fully formed horns. Their purpose is simply that of weapons, wherewith the stag fights for the possession of the females, the victor driving his vanquished antagonist out of the herd. In these encounters the horns are frequently broken. Were they permanent, the finest stag of the country would be placed at a disadvantage, and unable to compete with a much weaker antagonist. But, as they are renewable, the

crippled stag has only to wait until the following year, when he will be furnished with a new and effective set of weapons, and can take his proper place at the head of the herd.

That the domesticated animals are, like the cultivated plants, descendants of a wild and useless ancestry is a well-known fact. Even that the camel must at one period have wandered the country at will is certain, though the epoch of its freedom is far before history began. Few animals have undergone a more complete change of character and habits than the Ass of the present day as it is seen in Europe. We are, and often with good reason, accustomed to look upon it as a down-trodden, broken-spirited slave, unworthy to serve the rich, and by a sort of prescription belonging to the costermonger and his class.

There is little to remind us of its ancestry, and to tell us that it is descended from the wild ass (*Asinus hemippus*), a creature whose name is proverbial for speed, cunning, and love of liberty. Canon Tristram well points out that in the original Hebrew, Ishmael is spoken of as a “wild-ass man,” whose hand will be against every man, and every man’s hand against him. The same translation is given in the Revised Version.

No metaphor could be more forcible even at the present day. The animal is spread over a considerable portion of the earth’s surface, some varieties living in the plains, while others, as in the illustra-

WILD
ASSES.



tion, prefer the lofty mountains. These animals are by some authors considered as distinct species, but I believe that the very slight differences of structure by which they are distinguished can be accounted for by influences of the localities in which they live.

The untameable character of the wild ass is forcibly expressed in the Book of Job.

“Who hath sent out the wild ass free ?

“Or who hath loosed the bands of the wild ass ?

“Whose house I have made the wilderness,

“And the salt land his dwelling-place.

“He scorneth the tumult of the city,

“Neither heareth he the shouting of the driver.

“The range of the mountains is his pasture,

“And he searcheth after every green thing.”

xxxix. 5—8. Again, in Jer. ii. 24,

“Thou art a swift dromedary traversing her ways,
a wild ass used to the wilderness, that snuffeth up the
wind in her desire; in her occasion who will turn her
away ?”

Both these quotations are from the Revised Version.

Even at the present time the chase of the wild ass is a favourite sport with those who can afford it, and to kill one of these wild, active and wary animals is a feat that covers the successful huntsman with glory; and now and then a very young animal has been captured, but is of no use for the service of man.

The black stripes which run along the spine and

across the shoulders are well marked in this creature, but reach their full development in the zebra of the plains. In Burchell's zebra, the stripes only occupy the upper portion of the limbs, instead of reaching to the pasterns, and in the quagga they do not touch the limbs at all, and only extend as far as the flanks.

In the domesticated ass we find only two traits of character which remind us of its wild ancestry. One is the survival of its untameableness in the obstinacy for which the ass is proverbial, and the other is its exceeding cunning.

It is well known that if a number of horses and an ass be confined in a field, and they make their escape, the ass is sure to be the liberator. Indeed, scarcely any fastening, except a lock, will baffle an ass that wants to open a gate. When well and tenderly treated (but not spoiled), the ass becomes quite a pleasant companion, affectionate, intellectual, and displays none of the obstinacy which is the only refuge of its ill-used relative.

Closely allied to the celebrated chinchilla are two natives of America, one inhabiting the north and the other the south. The one is called the Prairie Dog (*Spermophilus ludovicianus*), and the other the Vis-cacha or Bizcacha (*Spermophilus viscacha*). These creatures are almost identical in appearance and habits, and therefore need not be separately described. They gather together like rabbits, each having its own burrow. Their colonies are often of great extent, and

in them the earth is so honeycombed with burrows, that it is not safe to ride through them except upon a horse which is to the manner born. The strangest



PRAIRIE DOGS.

part of their economy is, that the burrows are not only tenanted by the legitimate owners, but by an odd little long-legged owl (*Athene*, or *Speotyto cunicularia*).

cularia) as well as by rattlesnakes. The snake is evidently an intruder, not to say usurper, but that the owl and prairie dog live together on friendly terms, there is abundant evidence. In her well-known "Voyage of the *Sunbeam*" Lady Brassey gives the following little history :—

"As we were riding along the dogs found and killed a Bizeacha in a bank. Just as Mr. Elliot had pulled it out, and had laid it dead in the field, its little companion owl arrived, and appeared to be in the most dreadful state of mind.

"It shrieked and cried as it hovered over us, and finally selected a small white fox terrier, who, I think, really had been principally concerned in its death, as the object of its vengeance, pouncing down upon its head, and giving him two or three good pecks, at the same time flapping its wings violently.

"The other dogs drove it off, but more than half an hour afterwards, while we were looking at some horses, nearly a mile from the spot, the plucky little owl returned to the charge, and again swooped down upon the same dog with a dismal cry, and administered a vigorous peck to him."

The "dog towns," as these colonies are popularly called, are of very great extent, and present a most singular aspect. It is not easy to approach them without being detected, but a telescope will do much to annihilate distance.

At the mouth of each burrow there is a mound composed of the excavated earth, and on the tops of

these mounds the prairie dog loves to sit upright, scanning the horizon, and keeping a sharp look out for danger. If it should take alarm, it gives a short dissyllabic bark, sounding like the word "Wen—cho," with a strong accent on the second syllable. In one moment the whole of the animals have disappeared, having plunged head foremost into their burrows. Presently they begin to poke their noses out of their burrows, and if they find that there is no need for fear, they gradually resume their former positions.

Although the animal is a rodent it has gained the name of dog from its barking cry. I have often heard the bark and watched the creatures engaged in burrowing. Mrs. Montague Turnbull had some years ago several prairie dogs. She had a large and deep pit sunk in the ground and lined with boards so that the animals could not escape. The pit was then nearly filled with earth, so that the prairie dogs lived practically the same life which they would have led in their own country. Mrs. Turnbull was kind enough to paint for me a picture showing the prairie dogs engaged in their usual pursuits, and a very interesting picture it is.

When unmolested, the prairie dogs increase as fast as the rabbit does, as is shown by the following extract from an American newspaper :—

"The prairie dog is a standing menace against the future prosperity of the grazing districts of the State. Draw a line from the Red River south of Colorado, and you mark the front of the greatest

immigration army ever dreamed of by man. From this line westwards, for two hundred and fifty miles, every square mile is infested by these devouring pests. They thickly inhabit a section of the country two hundred miles long, and two hundred and fifty wide.

"The advent of the white man has but increased their numbers, as man has destroyed the wolves, badgers, rattlesnakes, panthers, and other animals which prey upon the prairie dogs. They eat the grass in summer and the grass roots in winter and the consequence is, that what was but a few years ago the finest grazing region in America is fast becoming a verdureless desert. It is no exaggeration to say that £2,000,000 does not exceed the value of the grass annually consumed by the prairie dogs in north-west Texas."



NATURE IN LITTLE.

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XI.

NATURE IN LITTLE.



OST of my readers must have seen the "Wonders of a Drop of Water" as exhibited by means of the oxy-hydrogen microscope.

Well do I remember being taken as a very small child to the Adelaide Gallery, then the home of popular science, and being horror-struck with the swarming hordes of living creatures which wriggled and twisted about on the illuminated disc.

I fully believed that all water, however pure it might appear to the eye, was full of these little creatures, and afterwards viewed with great suspicion the glass of water which was offered to me in the nursery.

The error was a very natural one, for the lecturer carefully avoided telling us that the water in question had been taken from a ditch, and not from a spring;

and that hay had been steeped in it for weeks before it was exhibited.

That living creatures were developed in such water was no new thing in science. Even with the unaided eye various tiny objects could be seen flitting ceaselessly through the water, some of them being so large and conspicuous that a simple magnifying lens could reveal much of their structure. As, in order to procure these creatures, decaying vegetable matter had to be infused in the water, these objects were called by the general title of Infusorial Animalcules.

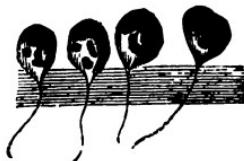
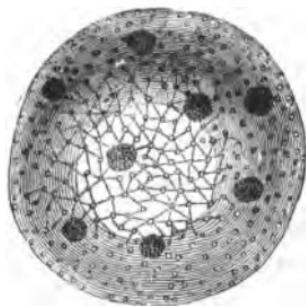
Chief among them was a tiny green globe, which roved through the water with considerable speed. It varied much in size, the largest equalling a small pin's head, while the smaller were scarcely perceptible.

When the magnifying lens were brought to bear on these restless beings they were seen to possess a marvellous and unexpected beauty. They were made of a very delicate and transparent membrane, which was crossed and recrossed with the finest imaginable green lines. These lines formed an irregular network, and at their intersections were tiny green spots.

How the globe was propelled through the water was not discovered until a much more powerful magnifying-glass was employed, and then each of the tiny green spots was seen to possess a long filament capable of being waved backwards and forwards, and so propelling the globe, just as the tail of the fish propels the body.

Four of these organs may be seen as they appear when magnified to a considerable extent.

It was evident that unless all these numberless filaments acted in concert with each other the Volvox, as the object is called, could not pursue any definite course, but must remain in the water almost if not quite stationary. Attempts were made



VOLVOX.

to discover any approach to a nervous system through which a common action could be induced in these "cilia," as the vibrating filaments were called, but none could be found.

Then it was discovered that the number of the Volvoxes rapidly increased, and there was no great difficulty in learning the mode. The globe only increased up to a certain size, and as it approached

maturity a number of smaller globes were gradually developed within it, containing still lesser globes within themselves. The parent globe then burst and perished, leaving the young to swim at liberty through the water.

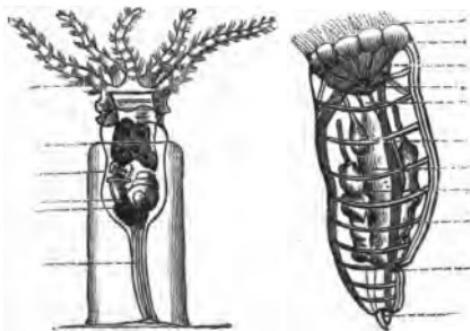
For many years zoologists tried in vain to find the relationship of the Volvox with other animalcules. At last the Volvox was discovered not to belong to the animal, but to the vegetable kingdom, and consequently it fell within the province of botany instead of zoology. Similar results have been obtained with a vast number of swiftly moving and exquisitely formed inhabitants of the water, all of which were considered to be animalcules until a comparatively recent date.

I have already stated that among the heterogeneous mass of objects which were classed together under the name of Infusorial Animalcules some are sufficiently large to be detected by the naked eye and their chief details of structure examined with an ordinary pocket lens.

Many of them were found to possess at the larger end of the body a remarkable apparatus looking exactly like one or more wheels with very fine spokes. Sometimes the wheels revolved with exceeding rapidity, and sometimes they stopped, but their movements were evidently under command. How these wheels revolved was a mystery, and their existence was an absolutely unique fact in zoology.

Where was the axis, and what was the driving machinery? The name of ROTIFERS, or Wheel-bearers, was appropriately given to these beings, and many naturalists undertook their examination.

Some of these creatures moved easily, though not swiftly, through the water. Some could crawl after the manner of the leech or the "looper" caterpillar, while some never moved from the same spot, and enclosed their bodies in little tubes. They could



ROTIFERS.

extend and contract their bodies like earthworms. They could withdraw the wheels entirely from sight or protrude them at will.

Just below the wheels was a dark-brown spot, in which a slight movement could always be seen, and a fairly powerful microscope showed that the spot was really a pair of boldly toothed jaws, differing in shape according to the species. At first the spot seemed to be circular, with a pair of lines crossing it at right angles to each other, but naturalists were

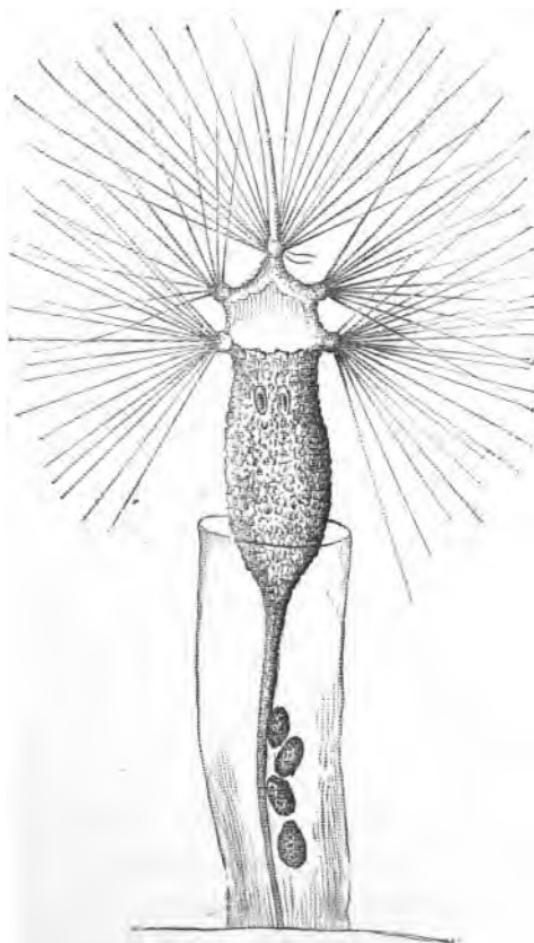
not very long in determining their real nature. They are so hard that if the Rotifer be squeezed flat between two glasses the jaws, or "gizzard," as the organ is frequently called, can be extracted and examined separately.

The whole dental apparatus is wonderfully elaborate, and may easily be investigated in the Brick-making Rotifer (*Melicerta ringens*). If it be examined with a powerful microscope it is distinctly resolvable into several parts. The actual jaws are composed of two hard plates, arranged very like the blades of a gardener's shears. Each of these blades is fixed to a handle, and strengthened by an elastic framework consisting of twenty or more curved horny ribs on each side, one end of each rib being fixed to the blade and the other to the system of muscles by which the jaws are worked. These strengthening ribs bear a remarkable likeness to the bars of the "cradle" used by mowers in many parts of England.

Now we will return for a moment to the "wheels."

If the reader will refer to the cut on page 267, which represents the Brick-making Rotifer in its house, he will see that there are four flat, rounded organs, each surrounded with tiny hairs or cilia (A). These are the so called "wheels," and it is evident that they have no power of revolution. They certainly do appear to revolve, but this appearance is due to an optical delusion. The cilia bends downwards in rapid and exact succession, so that the eye follows them and the delusive appearance is created.

The roll of the sea-wave towards the shore is a familiar example of this optical effect. So complete



GLASS-TUBE ROTIFER.

is the deception that when looking at the sea it is almost impossible to rid the mind of the idea that the waves are rushing onward towards the shore,

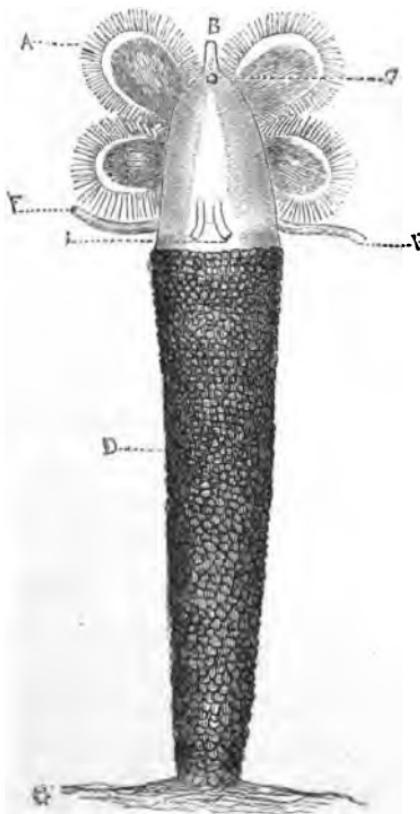
instead of merely rising and falling in succession in the same place. Similar waves may be seen when wind is passing over a field of corn or grass ready for cutting. Every one knows that the roots of the corn are fixed in the ground, and yet the eye instinctively follows the waves and travels over the field. Many optical toys, notably the "chromatropes," are constructed on this principle.

The ingenious "Chinese Fireworks," which were once so popular for drawing-room entertainments, and may probably be resuscitated with modern improvements, were constructed in accordance with the same law of optics which causes the waves of the sea to roll apparently to the shore, those of the corn to pass across the field, and the "wheels" of the Rotifer to revolve.

Next we ask ourselves the object of these organs. They are intended to produce currents in the water, by which the small edible objects which are in the water, whether they be living or dead, are carried into the gizzard. After the food has undergone mastication in the above-mentioned jaws it passes into the stomach, and thence into the highly organized digestive system. I have noticed that the jaws appear to be almost always at work, and even though the wheels are withdrawn and the cilia are at rest, the jaw continues the process of mastication. As the Melicerta represented in the illustration is partly concealed by its opaque tube the jaws are not very well shown, the only indication of their cutting

machinery being the two cutting blades which are indicated at E.

The mode in which the creature constructs its



BRICK-MAKING ROTIFER.

tube (D) has been often watched, and is wonderfully interesting.

Between the wheel-flaps there is a small additional organ, sometimes called the "pellet-flap." It is shown

at **B**; but the artist has made it too cylindrical and omitted the cilia with which it is edged. Within this flap various particles of hard substances which float in the water are perpetually whirled round by the action of the cilia, or rather by the current induced by the regular movements of the cilia, and are thus moulded singly into tiny balls. About three minutes are required to make a single spherical brick.

As they are completed the *Melicerta* bends its body and deposits them in regular layers, just like the courses of bricks in our houses. No entomologist can see these beautiful tubes without being reminded of the tubular towers built by the Sand Wasp as a protection against enemies.

Very pretty effects have been produced by shifting the *Melicerta* alternately into water stained with carmine, then into plain water, and then into water in which a little indigo has been infused. The animal is, therefore, obliged to make its spherical bricks of the materials which float in the water, and so makes its tubes in alternate layers of crimson, plain, and blue bricks. The projecting organs marked **r** are generally called "antennæ," or feelers, or tentacles, but I have great doubts whether they can be used as organs of touch. The animal certainly protrudes them before it opens its fans and set its wheels going, but it never moves them about as if they were true antennæ. At the end of each there is a tuft of very minute, but stiff bristles, which can be wholly extended, but are generally half withdrawn into the tentacles.

Another of these lovely tube-making Rotifers is here given.

A portion of the gizzard jaws can be seen just below the wheel flap, and the apparently rotating apparatus has longer cilia. The tube, instead of being nearly opaque, is transparent as glass, and does not serve to conceal the inmate from sight. Within the tube are seen a few of the curious eggs, the history of which would occupy too much space ; and the reader will notice that the foot, if we may so call it, is fixed to the object on which the creature rests.

I must warn the reader that in observing these tube-making Rotifers the greatest caution is needed. They are wonderfully timid, taking alarm at any sudden movement, and collapsing at once into a shapeless heap at the bottom of the tube. A heavy step in the room, or even dropping a pencil on the table, will act like magic on them, and though they may be fully expanded, with the wheels working merrily and the jaws at work, down they will go in a moment, and may not reappear for the next half hour.

Perhaps the reader may wonder that such creatures should be capable of alarm, but he will not be surprised when he knows the true place of the Rotifers in zoology.

Ranked for many years after their discovery with the infusorial animalcules, and thought to be scarcely higher than the protozoa and far below the polypes

of the corals, the Rotifers are now ascertained to possess an organism which brings them very near to the vertebrate animals. Far, far above the corals, jelly-fishes, star-fishes, worms, and centipedes, the Rotifers rank higher than the bees, ants, wasps, and butterflies. Their structure is even superior to that of the spiders, scorpions, crabs, and lobsters, and they occupy a position intermediate between the crustacea and the molluscs.

A more startling revelation has never been made ; for that the tiny Melicerta, which builds its tubular habitation below the surface of the water, and cannot move from the spot in which it is fixed, should rank higher than the sand-wasp, which builds its hollow tower on the ground, seems at first sight incredible. Yet it is an incontrovertible fact which possesses a special value in these days of investigation. It teaches us how little we know at present of the Creator's wonderful works, and how dangerous it is to found theories and systems on assumption which a little further knowledge may shatter to pieces and assign to the limbo of forgotten fallacies.



THE WORLD'S PURIFIERS.



XII.

THE WORLD'S PURIFIERS.

1.—TIGER BEETLES.



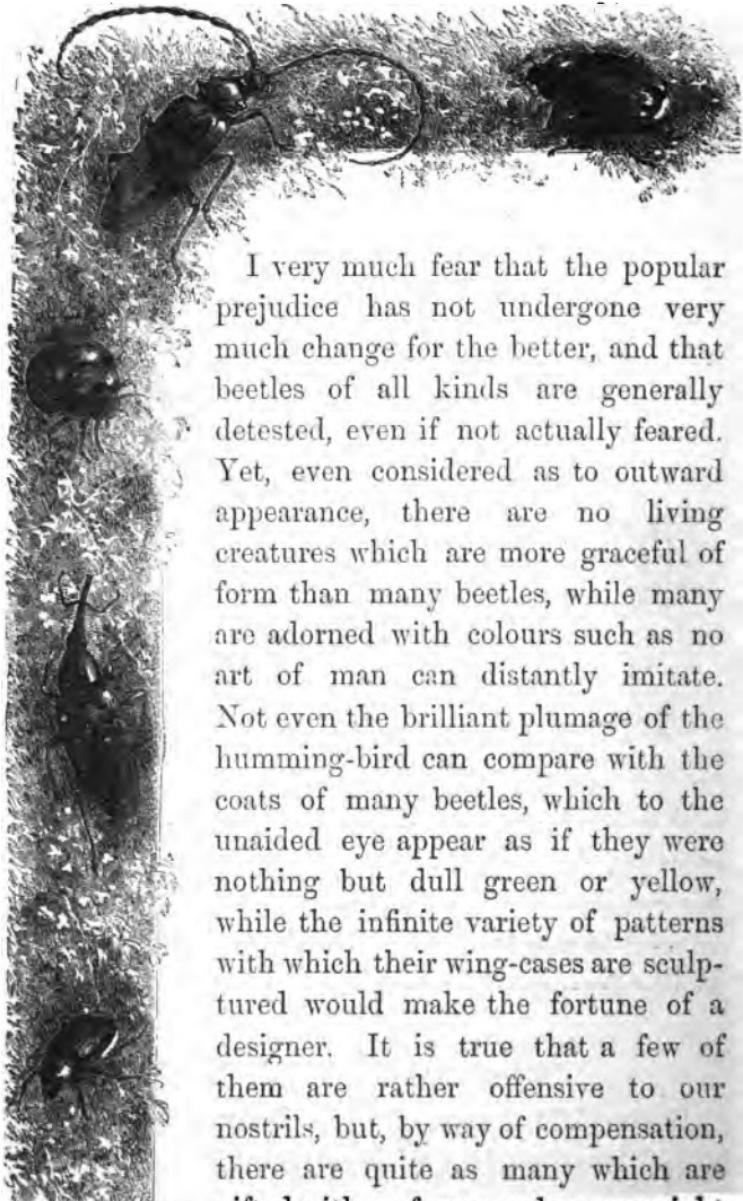
ETAPHORICALLY speaking, the Beetle has been on its back for many a long year. Let me try to set it on its legs.

Perhaps no insects have been less understood than the beetles. Even Shakspeare, though he could find a compassionate word for the “poor beetle that we tread upon,” could not find a kindly or appreciative word for it. On the contrary, he shared the popular belief that beetles are noxious, hateful, and objectionable beings, and baneful to mankind. In the *Tempest*, where Caliban reviles Prospero, he invokes—

“All the charms
Of Sycorax, toads, beetles, light on you.”

In the *Midsummer Night's Dream*, where Titania sleeps, her attendant fairies sing—

Beetles black, approach not near.”



I very much fear that the popular prejudice has not undergone very much change for the better, and that beetles of all kinds are generally detested, even if not actually feared. Yet, even considered as to outward appearance, there are no living creatures which are more graceful of form than many beetles, while many are adorned with colours such as no art of man can distantly imitate. Not even the brilliant plumage of the humming-bird can compare with the coats of many beetles, which to the unaided eye appear as if they were nothing but dull green or yellow, while the infinite variety of patterns with which their wing-cases are sculptured would make the fortune of a designer. It is true that a few of them are rather offensive to our nostrils, but, by way of compensation, there are quite as many which are gifted with perfumes such as we might only expect from the sweetest flowers.

As to their uses, it is not easy to say what may be the ultimate use of any being whatever, or the influence which it exerts upon the world in general. That each species of beetle must exert some active influence upon the world is evident from the fact that it exists. Had it no work to do, it would be withdrawn from the world, in accordance with the divine law, which has no toleration for idleness.

I purpose in the following pages to take a few typical examples of the beetle tribe, and to lay before the reader some of the work which they do. I shall not, however, venture to say that they have no other work, or to define the ultimate object of the work which we see, whether it be done in their larval or perfect state of existence.

There can be no doubt, however, that food is one of the chief agents employed



not only by the beetles, but by all living beings, including man himself, in carrying out the object of its temporary sojourn upon earth. No insects have so wide a range of food as the beetles ; and, if for that reason alone, they are deserving of our consideration.

Roughly speaking, we may divide the beetles into carnivorous and vegetarian, and will take them in that order.

Firstly, however, we must be able to define a beetle, or coleopteron.

All insects have normally four wings, though in some all four wings are rudimentary and left undeveloped. In others, such as the house-flies and gnats, there are apparently only two wings. Still, in fact, there are really four, but the hind pair are rudimentary, so that only the two front wings are used for flight. In beetles, however, the hind pair only are used for flight, the front pair being very much thickened, useless for flight, and serving as covers for the hind pair when the insect uses its legs for locomotion.

As to their life-history, it is, in all the main points, similar to that of other insects. It begins with the egg, from which is hatched the larva, or grub. In process of time the larva becomes a pupa, which in its turn becomes developed into the perfect insect.

Except in some few instances, where we can keep the creature under our eyes through all its stages, it is very difficult to trace the progress of an individual.

We can easily do so with the butterflies and the

generality of moths, the eggs being laid in the open air, and the larva or caterpillar feeding upon leaves, so that it can be kept in sight. But most of the beetles pass their existence under very different conditions. As a rule, in the larval state they are darklings, and shun the light to such a degree that if they are compelled to live in the light their natural conditions are altered, and the insect cannot be expected to thrive.

Some, however, have been watched throughout the whole, or the greater part, of their lives, and I propose to take our examples almost wholly from them.

Beginning with the carnivorous beetles, we will first take those which feed on living prey, and which in consequence possess a highly organized structure. Externally, as they have to catch their prey in fair chase, they possess active limbs and powerful jaws, many of them being gifted with swift wings. Such



TIGER BEETLE.

are the Tiger Beetles, one of which is shown in the preceding illustration.

Even if he had never heard of such an insect, any student of nature would know from the figure that the beetle must not only be carnivorous, but that it must be in the habit of chasing living and active prey. The firm and graceful outlines of the body and the formation of the legs show that the creature is swift of limb ; but even if the rest of the body had been destroyed and nothing left but the head, an entomologist could at once deduce from it the character of the insect to which it belonged.

The enormous and projecting eyes, which occupy a very large portion of the head, denote that a large range of vision is required, while the long sharply-pointed jaws, the tips crossing each other when closed, so that prey, when once seized, could have no hope of escape, show that the beetle must be rapacious as well as carnivorous.

There are many of these Tiger Beetles (*Cicindela*), as they are appropriately termed, several of which inhabit our country. One of them, the Green Tiger Beetle, is plentiful on most waste grounds where the soil is sandy. I well recollect my first acquaintance with this beetle.

I was little more than a boy at the time, and had gone out with an insect net to the outskirts of Bagley Wood, near Oxford. On a sandy knoll I saw several dull green beetles running about with extraordinary activity, but succeeded in pouncing upon several and

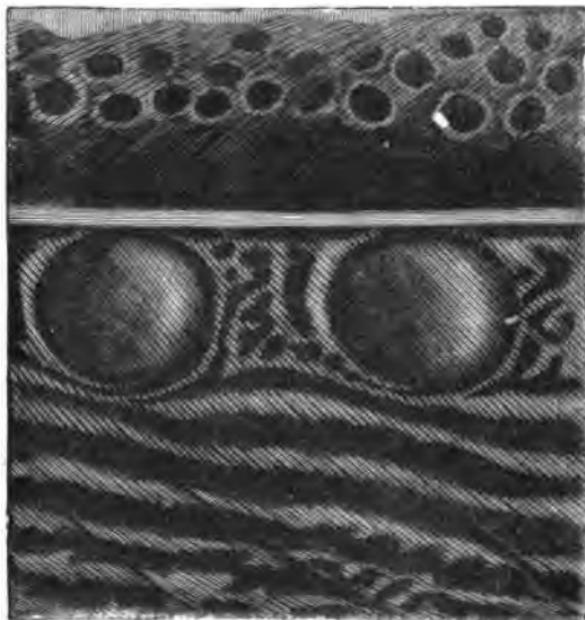
putting them into my tin collecting box. (N.B.—I did not then know the virtues of the “laurel-bottle” as a mode for almost instantaneous destruction of insect life.)

I had also seen plenty of shining blue flies on the wing, but in my ignorance I mistook them for blue-bottles, and did not trouble myself about them. Presently, however, one of these flies settled on the sandy knoll, folded its wings, and, to my profound astonishment, became a beetle, and ran away almost as swiftly as it had flown. Of course I caught as many as I could and betook myself homewards.

I had been all the time conscious of a rather powerful odour somewhat resembling the perfume of sweet-briar leaves, but had no idea that the beetles were in any way connected with it. But when I reached my room and opened the box, the fragrant odour that rushed out of it showed at once that it was exhaled by the beetles. The potency and permanence of this odour are most remarkable. I had put a pair of kid gloves in the same pocket which contained the tin collecting box, and though the box was tightly closed the gloves retained the sweet-briar-like perfume for many days.

On “setting” some of them in the attitude of flight, the instantaneous change of colour, from metallic blue to dull green, was at once explained. The upper surface of the abdomen was shining blue, while the wing cases (*elytra*) were dull green. Consequently, when the insect alighted the wings were folded upon the abdomen, and then covered by the closed *elytra*.

I have used the word "dull green" to express the colour of the wing cases, because they present that appearance to the unassisted eye. But if the insect be placed beneath the half-inch object glass of a good microscope, and a brilliant light concentrated upon it, the observer is almost dazzled with the intensity and variety of the colours which bedeck it.



SECTION OF A FEATHER.

If a feather from the head or breast of a hummingbird be placed under the microscope, half its gorgeous colours vanish. But with the Tiger Beetle the effect is reversed, for it would be impossible for the keenest human eye even to imagine the jewelled glories of the Tiger Beetle's elytra.

The interest of this beetle does not cease with its personal splendour, its activity over the ground or in the air, or in fact with its existence in the perfect state. While a larva or grub it is quite as interesting in its way. It is not by any means a pretty larva, and in fact is rather an ungainly-looking creature, grey-brown in colour, with six little legs, so feeble that they can hardly drag their owner over the ground, its head armed with two long curved jaws, and having one of its "segments" or rings of the body very much swollen, and furnished with a couple of stout hooks.

Although it does look ungainly on a smooth or even a level surface, it becomes a different being when in its own home. It makes in the ground an almost perpendicular burrow, out of which it never ventures until it assumes the perfect form. Yet, as is evident from the shape of the jaws, it is predacious, and moreover requires a large and constant supply of living prey.

How is it to obtain that prey while it is imprisoned in its burrow?

That it should catch its insect prey by fair chase, as it does after it has assumed its perfect form, is manifestly impossible, and it must therefore possess some other means of appeasing its insatiable hunger. The mode which it adopts is somewhat similar to that which is employed by the ant-lion.

I have already mentioned that the larva of the Tiger Beetle lives in a perpendicular burrow, and that

it has a pair of hooks upon an enlarged segment. This segment is the eighth in order, counting the head as one, and its use is very remarkable.

When awaiting prey the larva ascends the burrow, but keeps the whole of the body within it. The head is laid flat on the ground, and the wide jaws are extended to their utmost. Considerable exertion would be needed in order to retain this position, but the enlarged segment and its hooks now come into play. The segment is so large that it nearly fills the burrow, and the hooks which project from it serve to keep the larva in position. As soon as an unsuspecting insect comes within range of the jaws it is seized, the hooks are unhitched, and the larva drops to the bottom of the burrow, which is sometimes more than a foot in depth.

Ants form a large proportion of the Tiger Beetle larva's food, for they have very imperfect sight, and are apt to blunder against obstacles which they do not know. Mr. Westwood, who kept many of these larvæ, says that when engaged in excavating they carry the earth on their heads.





2.—GROUND BEETLES.

DEXT we will take a vast family of predacious beetles which do not require wings to aid them in catching prey, and are therefore called Ground Beetles (*Carabus*). This last word is Greek, signifying either a crab or a hard-shelled beetle, and has been pressed into the service of entomologists in order to designate the beetles belonging to this particular family. Some of the larger species are singularly graceful in outline, as may be seen from the two examples which are here given.

Plentiful as these insects may be, their life-history is not easily written. The Tiger Beetles give but little trouble, for the simple reason that they are essentially lovers of light and heat, and, like the ants on which they prey, are children of the sun.

But the great *Carabus* family are as a rule darklings, and whether in their perfect or larval condition do not care to face the sunlight. This is the more

wonderful, because their forms are so graceful, and in many cases their colouring is so lovely, and requires so much light for its manifestation, that we, in our ignorance, cannot understand why these beings should shun the light. A parallel example may be found in the marine worm which is called by the very appropriate name of Aphrodite.

Its body is clothed with hairs, each of which when the light shines upon it looks like a waving beam of prismatic light, the hues changing with every movement.

Yet, not even the rat-tailed maggot lives so sordid a life. Nothing, to human eyes and nostrils, can be more repulsive than the black mud which settles upon our shores, and which is almost wholly composed of decaying organic matter. Buried under this fetid mud lies the Aphrodite, a phenomenon as remarkable as if the most brilliant humming-bird were to inhabit the Mammoth cave, where no ray of light could touch its gorgeous plumage.

Phenomena such as these ought to make us less ready to pronounce judgment on the work of our Creator, and more ready to echo the wise humility of one who dared to acknowledge that these things were too wonderful for him.

There is one member of this group whose work—or, at all events, a part of whose work—is self-evident. This is the beetle which is scientifically known as *Calosoma sycophanta*, but which, on account of its great rarity in this country, has no popular name.

All over the warmer portion of the Continent, however, its value is now acknowledged.

There is on the Continent a moth the larva of which is called the Processionary Caterpillar, on account of the remarkable organization which it possesses. As a rule caterpillars are very independent beings, each one shifting for itself, and not acting in concert with others. But the Processionary Caterpillars have a fashion of marching with a precision which would do honour to the most perfectly drilled troops of modern times. A single caterpillar takes the lead, and the rest follow in "Indian file," the head of one almost touching the tail of its predecessor. On account of their numbers these caterpillars are exceedingly destructive, and would be even more injurious were it not for the *Calosoma* beetle, which deposits its eggs in the habitation of the Processionary Caterpillar.

These latter creatures dwell in a common silken web spun by themselves, and very much resembling the home of the Little Ermine moth which is so plentiful in our hedges and fruit trees. No sooner is the *Calosoma* grub hatched than it begins to eat the caterpillars, and, as it is exceedingly voracious, it makes great havoc among them. So true is the instinct of the mother-beetle that there is scarcely a web of the Processionary Caterpillar in which at least one *Calosoma* cannot be found. Sometimes several of the larvae of this beetle are to be found in the same Processionary nest, and then they are rather apt to defeat their own objects. They do not seem to possess the

least discrimination, but when they come across anything alive and soft they consider themselves bound to eat it. Consequently, it occasionally happens that one *Calosoma* larva comes upon another, and "strikes it amidships," as a sailor would say. The natural result takes place, and while one *Calosoma* grub is hunting for Processionary Caterpillars, it is being devoured by one of its own brethren. Here, again, we recognise the forethought of the Creator. The sense of pain, terrible as it is to beings of a higher organisation, is so slightly developed that the *Calosoma* larva will be so absorbed in devouring a Processionary Caterpillar that it does not know that it is itself being eaten by one of its own kinsfolk. Again, these things are too wonderful for us.

Pass we from earth to water.

My inveterate enemy, lack of space, compels me to omit the whole of the beetles which inhabit the sea-shore and the brackish waters of tidal estuaries, and to class together the many predaceous species which inhabit our ponds and inland streams. These insects play exactly the same parts in the water as are undertaken by the Tiger Beetles and Carabidæ on land.

Whether in their larval or perfect condition, the water-beetles, or *Dyticidæ* (Gr. *Dytikos*, or Diver), are as ferociously carnivorous as any of their fellow-labourers ashore. That beetles which breathe atmospheric air should be able to spend their whole lives in the water, excepting the short time that is expended in flying from one pond or stream to another, is a very

remarkable fact. Still more remarkable is it that these insects should be able to exist for a long time under water without any access to the air which they require as much as we do. The details of structure by which they are enabled to live so strange a life are full of beauty and interest, but our very limited space forbids any description of them.

For the same reason I am forced to omit many other predaceous beetles, and must pass to those which are carnivorous, but which do not catch prey for themselves.

In the work of all these beetles one design is evident, though the modes by which it is carried out may differ according to the species. Chief among them come the Burying Beetles, of which we have many examples in England.

These wonderful beings feed, by preference, on the bodies of the smaller animals, such as mice, birds, &c., and, as is well known, have a habit of burying them when the ground is sufficiently soft. On hard ground the beetles have to be contented with placing their eggs in the dead body, and leaving them to take their chance.

Civilisation, too, has its drawbacks for the burying beetles, as the continual absorption of forest and field into cultivated ground and houses necessarily limits the supply of dead animals left to decay on the ground, and these beetles are therefore obliged to make shift as they can. There are some spots, however, where civilisation does furnish a supply of food

for these beetles, though not exactly the kind of diet which they prefer.

Along the banks of tidal rivers, and for many miles from their estuaries, there are always to be found the bodies of deceased dogs and cats in various stages of decay. I have found within these bodies almost every species of carrion-eating beetles, the larvæ of which absolutely swarmed within them. Indeed the larvæ are much more active scavengers than the perfect insects, and it is chiefly to them that we must look for the removal of substances which, if allowed to remain, would not only be offensive but injurious to man.

The mole-catcher, a product of civilisation, also furnishes many of these beetles with food. It is impossible for the beetles to bury the dead moles which their slayer hangs on bushes, so the insects can only deposit their eggs, and leave them to be hatched in the suspended carcases. Should the weather be tolerably moist, the young can pass through their larval stage while hidden within the body of the mole, and can then drop to the ground and bury themselves in it, so as to pass through their pupal stage in safety.

Should, however, the weather be hot and dry, the bodies become hard and shrivelled, so that these larvæ are not able to eat it, and consequently perish. But when one set of devourers fails another takes its place. There are certain small beetles scientifically known as *Dermestes* (from a Greek word signifying

skin), and popularly called Museum Beetles or Bacon Beetles.

These insects are so formed that they can devour the toughest and driest skin, and in consequence, when they make their way into museums or provision stores, are the terror of the proprietors. But although they are out of place in buildings, and the very sight of the hair-clad cast skin of a single larva will force the curator of a museum to discover and destroy the insects without an hour's delay, they are invaluable in the open air, as completing a task for which the Burying Beetles and their kin are inadequate.

See, then, how wonderfully everything is arranged. Suppose, for example, that the body of a large dog or bird has been left to decay on the surface of the ground; scarcely has decomposition begun when the carrion-eating beetles find it out, and deposit their eggs upon it. The young are soon hatched, and, having plenty of food, grow with great rapidity, always choosing the putrid portions, and leaving the rest until it also becomes soft enough for their jaws. In this task they are aided by the blow-fly maggots, which, from their peculiar structure, can wriggle their pointed bodies into spots which cannot be reached by the comparatively wide-headed beetle grubs.

Then, after they have consumed the interior, the skin, which has meanwhile become dry and hardened by the sunbeams, is attacked by the Dermestes. Lastly, the hairs of the dog, or the feathers of the bird, afford nourishment to the larvæ of the various clothes moths,

so that nothing is left but the bones. These, by the ceaseless labours of the earth-worm, become covered with soil, and so afford nourishment for the roots of plants.

The accompanying illustration represents another



SCARABÆUS.

insect. This is the celebrated Scarabæus (or Ateuchus, as it is now called), which is so prominent an object in Egyptian art, especially in sculpture and hieroglyphic writing. It was used as a symbol for

the creative power of the universe, and for a rather curious reason.

To these beetles, of which there are many species, is appointed the task of removing animal refuse from the surface of the ground. They do not eat it themselves, but it constitutes the food of their young.

They gather a sufficient quantity together, and work it into a roughly spherical ball, in the centre of which the egg is placed. The beetle then finds a soft piece of ground, and with her enormously powerful fore legs digs a deep hole, large enough to receive the ball easily. Then she returns to the ball, turning her back upon it.

Rearing her body in the air, and resting on the first and second pair of legs, she places the claws of the hind legs upon it, and so pushes it backwards to the pit which she has dug. In so doing she rolls the ball over and over, so that the outside becomes thickly coated with dust, and soon becomes nearly smooth, and hard in the sun, thus forming a further protection to the egg. Having reached the pit, she tumbles the ball into it, and then goes off to make another.

Thus, not only are noxious substances removed from the surface of the earth, where they can do no good, but they are buried below the surface, and serve as fertilisers.

The Egyptians were necessarily familiar with the ball-making and burying processes, but they were not aware of the enclosed egg, and so thought that the beetle had the power of creating its young.

In these days of exact science it is interesting to note the impressions which were made by natural objects upon the minds of observers who lived in the pre-scientific times. There is, for example, a wonderfully well-written and very quaint treatise by De Mouffet, in which the writer mixes up facts, theories, and his own generalisations after a most amusing fashion.

"The Latines call it *Pilularius*, because it turns up round pills, which it fashions by turning them backwards with its hinder feet. All your *Pilularii* have no females, but have their generations from the Sun. They make great bals with their hinder feet, and drive them the contrary way; like the moon, it observes a circuit of twenty-eight daies. For this reason, the Ægyptians consecrated this to Apollo, and adored it for no small god.

"They go but slowly, yet they labour continually and exceedingly, and delight most of all to produce their young ones. For oftentimes the little round bals that they make, by the injury of the winds in places, fall away, and fall from a high place to the bottom. But this Beetle watcheth with perpetual care, and raising this Sisyphean bal to its hold with continual striving, and, that tumbling back again, at length he produceth it.

"And truly, unless it were endowed with a kind of Divine Soul (as all things are full of God's wonderfullnesse) it would faint and be spent in this great contest, and would never take pains this any more.

"Beetles serve divers uses, for they both profit our mindes and they cure some infirmities of our bodies. For when this living creature doth excel man in divers faculties, this should teach us modesty, temperance, labour, magnanimity, justice, and prudence. For it lives by the laws of Nature, and will not exceed her orders.

"The greatest care it takes is to make the greatest bals it can, as if it were sweet bals which with wonderful labour it rolleth from it; and if it chance to roll its burden against some heap, that the bals slip away and fall down again, you would imagine that you saw Sisyphus rolling a stone to the top of a mountain and falling back on him. Yet it is not weary, nor will it rest till it hath rolled it to its nest, so earnest is it about its work.

"But we poor men do nothing that is worth our labour, or as we have power to do, and we give off in the very steep entrance of vertue, and we spend all our pains and daies in idleness, following ill counsel, till we get a habit of mischief to our own destruction."

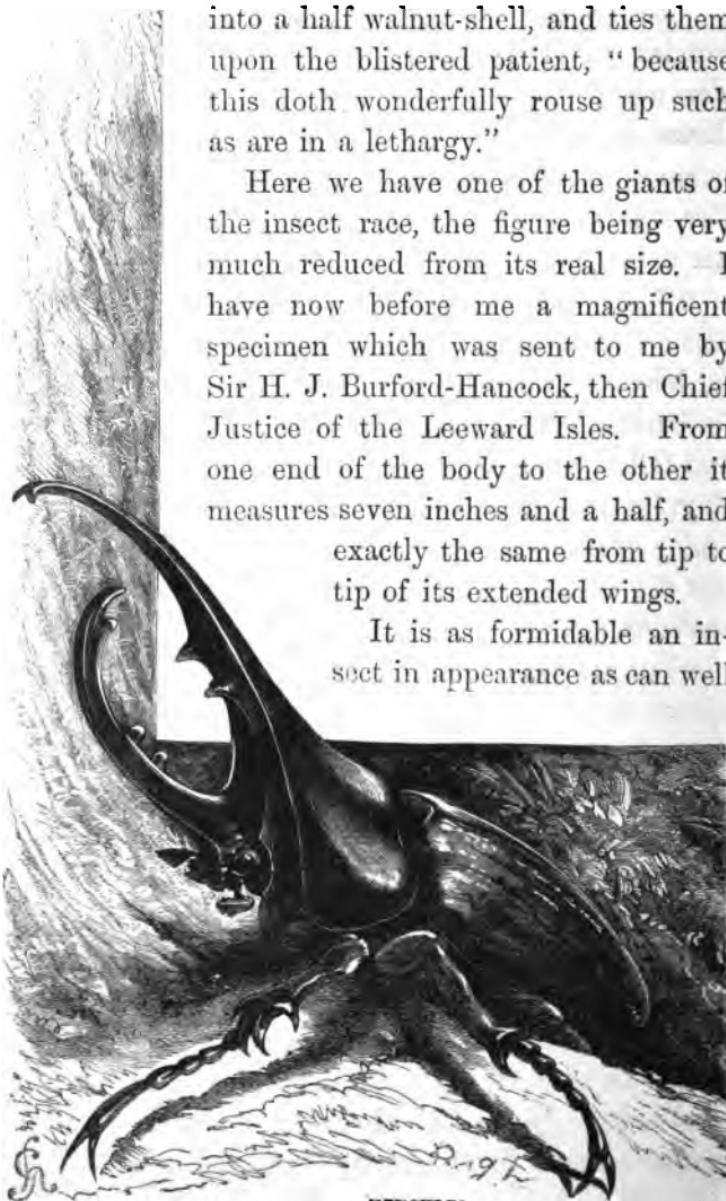
After relating the moral benefits which man ought to derive from this insect, the ingenious writer proceeds to enumerate its uses in medicine. One of them is too curious to be omitted.

If the patient be fallen into a faint or trance, and cannot be roused, the physician has recourse to the Scarabæus. He shaves the back of the neck, then applies blisters to the neck, arms, and soles of the feet. Then he takes the beetles, puts each of them

into a half walnut-shell, and ties them upon the blistered patient, "because this doth wonderfully rouse up such as are in a lethargy."

Here we have one of the giants of the insect race, the figure being very much reduced from its real size. — I have now before me a magnificent specimen which was sent to me by Sir H. J. Burford-Hancock, then Chief Justice of the Leeward Isles. From one end of the body to the other it measures seven inches and a half, and exactly the same from tip to tip of its extended wings.

It is as formidable an insect in appearance as can well



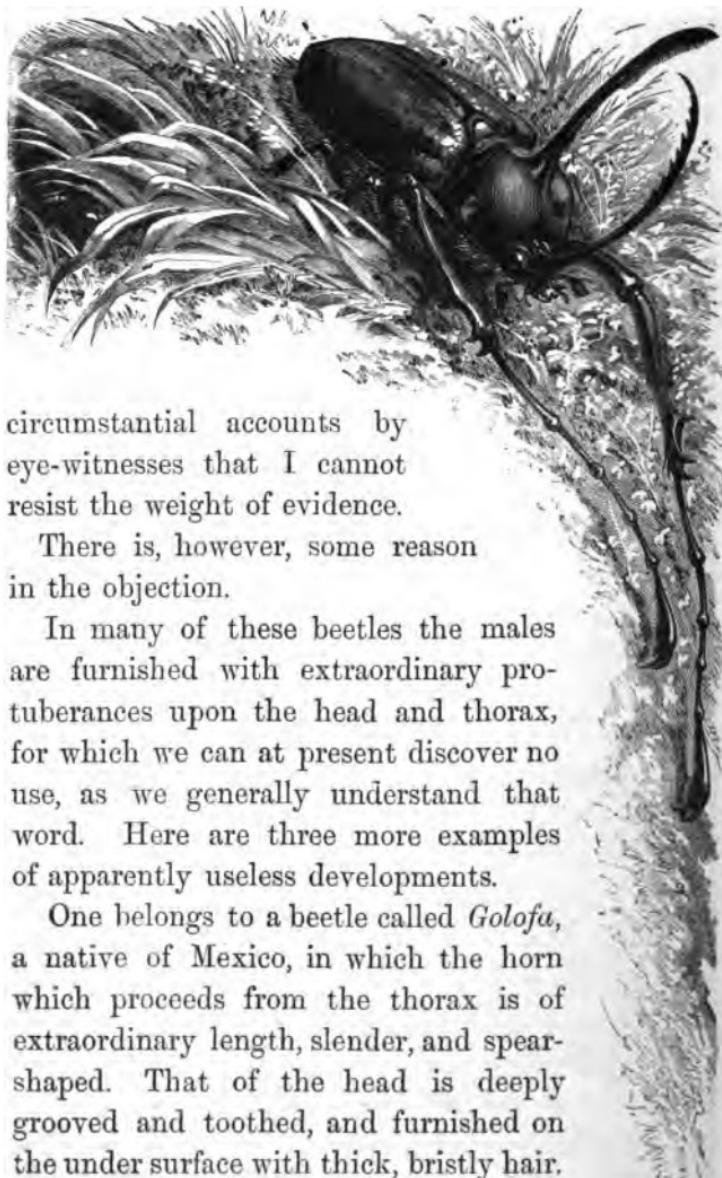
HERCULES.

be imagined, seeming to possess a terrific pair of jaws, with grasping power equal to lobsters' claws. In reality it is a perfectly harmless creature, having no jaws that could even injure a fly.

If the reader will examine the figure with a little care, he will see that the apparent upper jaw, with its formidable teeth, is no jaw at all, but only a projection of the thorax, while the apparent lower jaw is nothing but a prolongation of the head. So, even if the most delicate human finger were placed between the teeth of the thorax and the head the insect could do it no great harm. An entomologist would at once see that the structure could not be a jaw, because the jaws of insects work sideways, and not up and down.

The real jaws of the beetle are placed on the under surface of the head, just below the eye and the antennæ. They are extremely feeble, and, like the stag beetle, the huge insect lives on the sweet juices of plants and trees. In some cases these juices are obtained in a very remarkable manner. The beetle seizes a young branch between the teeth of the head and thorax, and then spreads its wings and flies. Of course it only goes round and round the branch, and so cuts a deep groove, from which issues the sap on which the beetle feeds.

This use of the prolonged head and thorax has been flatly denied, and various reasons given in order to show that such a process would be impossible. I was of the same opinion myself, but I have had such



circumstantial accounts by eye-witnesses that I cannot resist the weight of evidence.

There is, however, some reason in the objection.

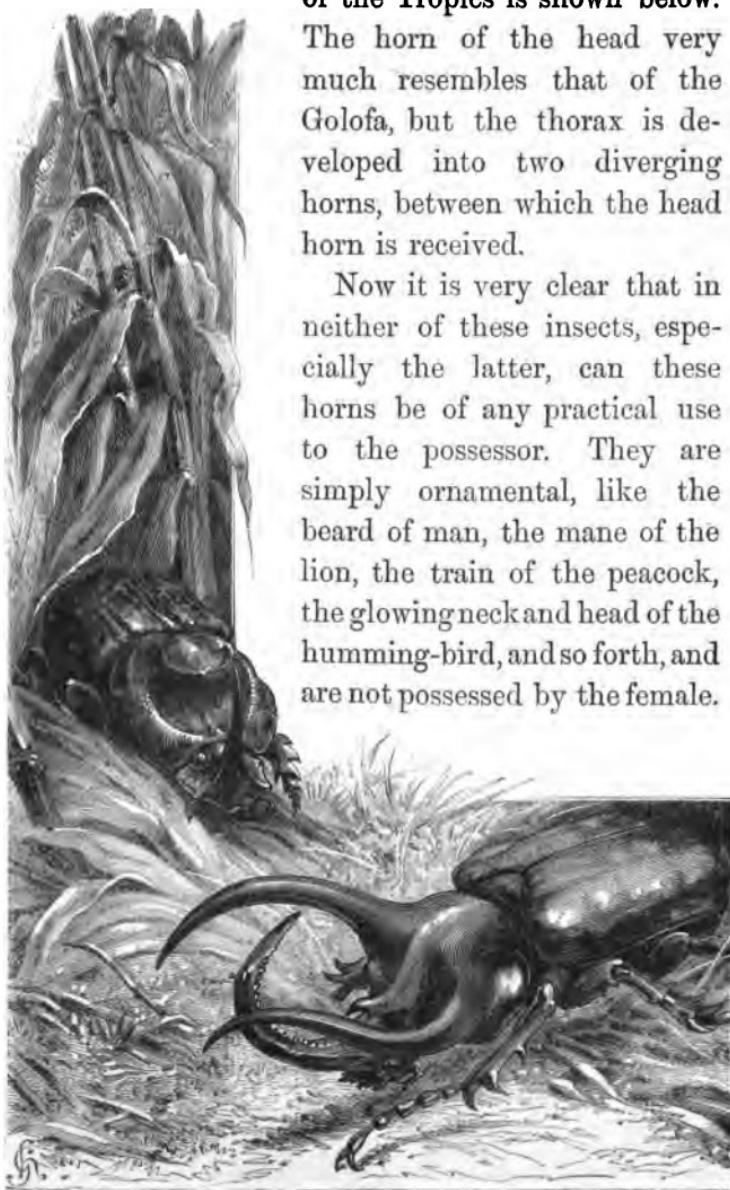
In many of these beetles the males are furnished with extraordinary protuberances upon the head and thorax, for which we can at present discover no use, as we generally understand that word. Here are three more examples of apparently useless developments.

One belongs to a beetle called *Golofa*, a native of Mexico, in which the horn which proceeds from the thorax is of extraordinary length, slender, and spear-shaped. That of the head is deeply grooved and toothed, and furnished on the under surface with thick, bristly hair.

Another of these wonderful inhabitants

of the Tropics is shown below. The horn of the head very much resembles that of the Golofa, but the thorax is developed into two diverging horns, between which the head horn is received.

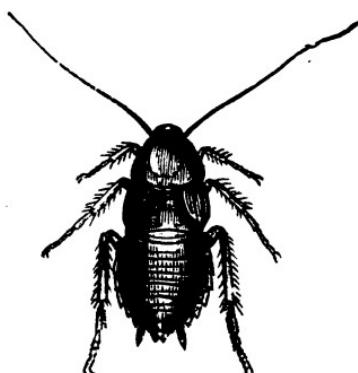
Now it is very clear that in neither of these insects, especially the latter, can these horns be of any practical use to the possessor. They are simply ornamental, like the beard of man, the mane of the lion, the train of the peacock, the glowing neck and head of the humming-bird, and so forth, and are not possessed by the female.



Nor, with all deference to Mr. Wallace, can I believe that they exercise any influence with the female in her choice of mates. The choice always lies with the male, and even in those cases, such as the lion, when two or more males fight for a female, the latter exercises no choice, but belongs, as a matter of course, to the victor.

So, even with the stout and sturdy *Megaceras* (*i.e.* Big-horn) the two enormous horns are nothing but ornaments. This very peculiar insect was discovered by Mr. Bates in Pará.

In our next chapter we will glance at a singularly interesting insect. This is the Stag Beetle, so called on account of the enormously developed jaws of the male. Those of the female are quite small and sharply pointed.





3.—STAG BEETLES, COCKCHAFERS, ETC.



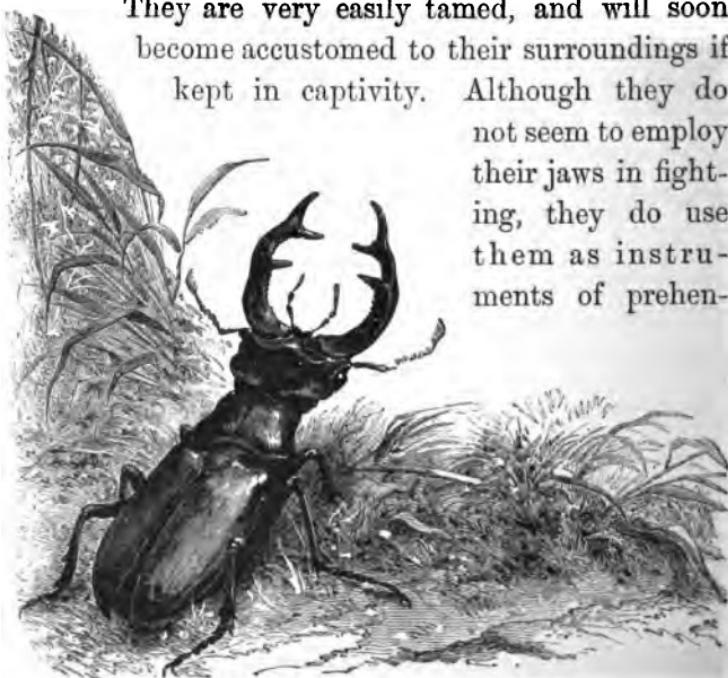
THE Stag Beetle is very peculiar in its choice of localities. It never seems to be a rare insect, and where it is not extremely plentiful it is totally absent. The reason of this capriciousness I cannot discover. There may be two localities not many miles apart having similar soil, similar trees, and even watered by the same river. All the conditions appear to us to be identical, and in consequence we might reasonably expect to find the same insects in both. Yet, for some unknown cause, the Stag Beetle will swarm in one of these localities, and never be seen in the other.

Another curious point in the life-history of this insect is its extreme variability in size, and even in form. A really fine male Stag Beetle will measure fully three inches in length, and be armed with enormous antler-like jaws. Another will scarcely exceed one inch in length, and the jaws will be slight,

feeble, and destitute of the sharp, tooth-like projections. It is almost impossible to make a novice in entomology believe that these little specimens will not grow to be large ones if let alone ; whereas, they simply are among Stag Beetles what giants and dwarfs are among ourselves.

Formidable as these jaws appear to be, the insect is not fond of exercising them. In fact, he is so little apt to use them that many practical entomologists have asserted that he never employs them as weapons. This is, however a mistake ; I have kept many of these fine insects, and have several times been smartly pinched by them.

They are very easily tamed, and will soon become accustomed to their surroundings if kept in captivity. Although they do not seem to employ their jaws in fighting, they do use them as instruments of prehen-





sion. If a little ball be made of cork or other light material, and placed in the case in which beetles are kept, they will soon find it and amuse themselves by knocking it about, just as a kitten might do under similar circumstances.

Also, they will soon learn where to find their food. If the reader will look at the head of the beautifully executed figure of a dead Stag Beetle, which appears on page 303, he will see that just at the base of the jaws there are two small feelers, or "palpi," as they are called, and that between them is a small tuft. In the living insect this tuft is of a bright orange colour, and if examined by the magnifying glass is seen to be composed of hairs. It is, in fact, a flat, hairy brush with which the insect licks the juices on which it feeds.

My specimens were extremely fond of moistened lump-sugar, but they were apt to crawl over it and

cover their limbs with the sticky solution ; so I made a simple arrangement by which only a small portion of wet sugar was exposed. The beetles very soon discovered it, and used to consume quite a large amount of the sugar.

Similar liquids being the only food of the Stag Beetle, one is disposed to wonder at Michelet's account of a combat between one of these insects and a beetle of another species.

"I saw an atrocious warlike struggle. The insect giant which we call the Stag Beetle, one of the largest of European species, a black, shining mass, whose horns bristle with superb crescent-wise pincers, had seized upon a beetle of far inferior size. Nevertheless, the two enemies being equally provided with admirable defensive arms, after the fashion of the corslets, armlets, and cuisses, of our ancient knights, the struggle was long and fierce. Both belonged to the murderous race which prey on little insects, were powerful lords in the habit of devouring their vassals ! " ("The Insect," by Jules Michelet, translated by W. H. Davenport-Adams.)

As a rule, the Stag Beetles, like the chafers and the dors, fly only after dusk. They are not swift of flight, and are in the habit of blundering against any object that may be in their way. Nothing is easier than to catch a Stag Beetle if it can be seen on the wing ; all that is needed is to throw a stick near it. There is no necessity to strike the insect, as it invariably descends of its own accord, and may be picked

up and examined at leisure, and, if not required, can be set at liberty none the worse for its captivity.

The larva of the Stag Beetle is a large, white-skinned, fat-bodied grub; the end of the abdomen



DEAD STAG BEETLE.

being much enlarged and bent inwards. It feeds upon wood, and is found within the trunks of trees, close to the roots, the burrows which it makes being large enough to admit a man's finger. It has generally been thought to be a destroyer of the tree, but I believe that it never attacks a healthy tree, the mother insect being guided by instinct only to deposit

her eggs in those trees which are already doomed. I have noticed that when the uppermost branches of trees begin to wither, the Stag Beetle larva is mostly to be found at their roots.

What may be the use, or whether there is any use, of the Cockchafer, I do not venture to suggest. I presume that where man has not interfered with nature, the Cockchafer may, and, in fact, must, serve some definite and useful purpose. But, to the agriculturist, this insect appears to be purely a terrible foe, without a single counterbalancing advantage.

Both in its larval and perfect states it is exceedingly destructive ; in the former case devouring the roots of plants, and in the latter leaves of trees. Except in size, the larva is almost identical in appearance with that of the Stag Beetle. It is popularly known as the White Worm, and in Ireland goes by the name of "Connaught Worm." The burrows which it makes are nearly perpendicular and are rather variable in depth. Hidden from sight, the Cockchafer grub feeds upon the roots of plants, cutting them off with its shear-like horny jaws. Were it not for two foes, one above and one below the ground, this grub would be as baneful in these islands as it is on the Continent, where I have seen the result of its ravages.

One of these foes is the rook, which, in the breeding season, wants these grubs as food for its soft-billed young. Some of our farmers are now beginning to

understand the real value of this bird, and to consider the grain, which the bird will undoubtedly eat in the autumn, as small wages for the great work which it does through the spring and summer in destroying the white worm.

The second foe of the grub is the mole, and if these two creatures be permitted to have their own



THE COCKCHAFER.

way, they can reduce the ravages of the grub to a minimum. When it ascends its burrow for the purpose of feeding, the rook, evidently guided by the sound of its jaws when eating the roots, drags it out by its head. When it descends to the bottom of its burrow, and is out of range of the bird's beak, it comes within range of the mole's claws and teeth. When it is remembered that the subterranean life of the Cockchafer grub extends over nearly three years,

during at least two-thirds of which time it is almost incessantly eating, some idea of its ravages may be formed.

In districts not very far from the sea-shore the gulls prove themselves friends to the agriculturist, and it is really a pretty sight to watch the white gulls and black rooks walking harmoniously along the brown furrows after the ploughman, and clearing off all the grubs which are exposed by the share.

In several parts of the Continent this creature has become so intolerable a scourge that large rewards have been offered for its destruction, the captors being paid a certain sum per bushel.

At present, neither in the perfect nor the larval state has the Cockchafer been utilised for the good of man, except that from the fat bodies of the larvæ has been extracted a coarse and not very fragrant oil, which could serve no better purpose than greasing cart-wheels, and which hardly repaid the cost of its production.

In the lovely insect figured lowest of the three in the picture on opposite page, we have a typical example of the long-horned beetles—a creature which really seems to belong more to the tropics than to these colder latitudes.

The figure is considerably reduced in size, but, as in the Stag Beetles, there being great variation in this respect, the artist may have taken his sketch from a small specimen. A really fine example of this beetle ought to measure rather more than an inch and a half

from snout to tail, the antennæ and legs being of proportionate dimensions.

The perfect insect is remarkable for two peculiarities. In the first place it exhales a very powerful odour, which bears some resemblance to that of the crushed sweet-briar leaf, but has not the least similitude to that of musk.

I have kept many living specimens of this beetle, and am certain that it has the power of emitting or withholding the perfume at will. The potency of the aroma is really wonderful. Only a few days before this account was written, one of my daughters was returning with me from service about 8.45 A.M., and both of us at once exclaimed, "Musk Beetle!" the odour of the insect having betrayed it from the other side of the rather wide country road.

Another curious point in



LONG-HORNED BEETLES.

the life-history of this insect is, that it is able to produce a sharp sound, somewhat resembling the squeak of a small mouse. The death's head moth possesses a similar power, and both insects, when they squeak, press their bodies against the ground.

Although this beetle is endowed with the most wonderful colours, looking under the microscope as if it were embossed with emeralds set in golden frames, and interspersed with an occasional ruby, sapphire, and topaz, I do not select it for its peerless beauty of colour and outline. Although it is gifted with sweet odour and the capability of producing sounds, I do not select it for either of these reasons.

It finds a place in these pages on account of its larval life, which is that of a wood-borer. As far as personal experience goes, the willow, poplar, and alder are the favourite localities of this larva, though I have found many specimens in the birch, especially on Cannock Chase. In every case, however, the tree must be dead or dying when the larva of the Musk Beetle can find a home in it.

By a fortunate accident, I once had the opportunity of purchasing an old willow-tree which was simply riddled with the burrows of this beetle. It originally ornamented one of the branches of the Cherwell, near its junction with the Isis, and the purchase was made on behalf of the Anatomical Museum to which I was then attached.

On rending the tree to pieces with wedges, the whole economy of the Musk Beetle was laid bare, and

multitudes of insects were found in every stage of existence. If the reader should happen to visit the Museum of Comparative Anatomy at Oxford, he may see some of the dissections which I made of these beetles. The organ by which the sound is produced I could never discover, and I can only hope that some one else has been or will be more fortunate.

The one point which I wish to bring forward is, that this beetle performs towards decaying timber the same task which the Burying Beetles and their kin perform towards decaying animal matter.

In its way, one is as noxious as the other, and each requires the good offices of a scavenger to remove it. As to the Musk Beetle larvæ, they simply riddle the tree, leaving a mere honeycomb of semi-decayed wood. Air and moisture are therefore admitted, with the result that fungoid growth takes place. This, again, forms the pabulum of other living creatures, so that nothing interferes with the total destruction of the tree except the bark. How this is removed we shall presently see.

There are many of these long-horned beetles, several species of which inhabit England. They can mostly be found in decaying wood, not being very particular as to the tree. Some years ago, while wandering in the grounds of a neighbour, I came across a number of stumps of fir-trees. A long period had elapsed since they were cut, and they were almost entirely hidden by ferns.

On examining one of these stumps, I found it to

be absolutely teeming with animal life. On one side, between the bark and the wood, was a colony of jet ants, and on the opposite side was a corresponding colony of yellow ants. -The neutral portion was inhabited by long-horned beetles, belonging to the genus Rhagium. They had assumed the perfect state, but had not as yet emerged ; and each of them was in an upright position and enclosed in its curious wooden cocoon, the construction of which is their last work in the larval state.

The largest and most striking of these long-horned beetles is the Harlequin Beetle, so called on account of the curious manner in which it is decorated with boldly-defined markings of black, scarlet, and yellow. It is a native of Guiana, and may be found slowly crawling upon the trees, sometimes swinging itself from branch to branch with its long legs.

In its perfect state it feeds only on juices. The collectors are aware of this fact, and when they wish to catch the Harlequin Beetle they wound the bark of a tree called Bagasse, and allow the sap to run out. This sap has a very peculiar and penetrating odour, and the beetles, which are extremely fond of the sap, will perceive it at considerable distances.

In its larval state it is a wood-borer. In the British Museum there is a valuable example of this fact, the beetle not having emerged from the cocoon ; it is very much like that of the Rhagium, and lies with its legs and antennæ folded into a wonderfully small compass.

The last beetles which can be mentioned are the

Weevils, which in this country never attain to any great size. In tropical latitudes, however, many of the weevils are of considerable dimensions.

One, the Palm Weevil (*Rhina palmarum*), which inhabits the West Indies, is very destructive among palm-trees and sugar-canés, but in its turn serves for food, not only to the negrò, but to the white colonists. It is eaten while in the larval state, going by the name of Gru-gru. It is fully as large as a man's middle finger, and is eaten alive, the head being held in the fingers. Half-a-dozen Gru-grus will make a sufficient meal, and many a human life has been saved by the knowledge of this source of food. It does not seem very inviting, but those who have once conquered their natural aversion find it to be one of the greatest delicacies which the country produces.

One of the most celebrated of the weevil tribe is the Diamond Beetle of tropical America.

To the unaided eye, this insect is not nearly so beautiful as many of the tropical weevils, its wing-covers being black and covered with rows of green spots. But when these spots are examined by the microscope their beauty is beyond all power of description. Each of them is seen to be a conical pit, the interior of which is set with leaf-shaped coloured scales, overlapping each other like the tiles of a house. Each scale is not only of a different colour, but the same scale will sometimes show two or three colours, according to the direction of the light.

Our last insect must be the little beetle called scientifically *Scolytus destructor*. It has no popular name.

This creature is the means by which the bark is removed from dead or dying trees. The mother beetle, being attracted by instinct to such trees, bores a hole through the bark, and then makes a long tunnel between the bark and the wood. Then she retraces her steps, laying eggs as she goes, and when she has completed her task dies, her dead body blocking up the entrance to the tunnel.

As soon as the eggs are hatched, the young grubs gnaw tunnels between the wood and the bark, always radiating at nearly right angles from the burrow made by the mother. Great numbers of these beetles attack each tree, and, in consequence, the bark becomes separated from the wood, falls off, and the air and moisture do their work in decomposing the wood.

These are but a few of the wonders of beetle life, and I have chosen them as showing the marvellous manner in which animal and vegetable life act and re-act upon each other, each doing the work which was appointed for them long before they came into existence.





4.—VULTURES.

N Matthew xxiv. 28, we read that in predicting the destruction of Jerusalem, our Lord said, "wheresoever the carcase is, there will the eagles be gathered together." Now we know that eagles usually catch their prey alive. But if the reader will refer to the revised New Testament and look at the marginal readings, he will see that the word Eagle is rendered as "Vulture." This rendering is the right one, and coincides with many passages of the Old Testament. The Hebrew word, which is wrongly rendered as Eagle, is Nesher, a word which is identical with the Arabic "Nissr" of the present day. Several passages indeed, this included, are quite unintelligible if we accept the word as representing any of the eagle tribe.

In the first place, eagles do not gather themselves together over carcases. They are comparatively few in number, and almost solitary in their habits, so

that when several eagles are seen together, they are nearly always the parents and their young which have not yet attained the age and strength which will enable them to establish nests for themselves.

In the next place, the appearance of the Nesher corresponds with that of the Vulture, as is evident from a passage in Micah i. 16 : " Make thee bald, . . . enlarge thy baldness as the eagle." Now, so far are the eagles from being bald, that they have their heads thickly clad with feathers, while those of the Vultures are more or less bald, the skin of the head and neck being bare with the exception of a few patches of fine down.

Not that eagles do not inhabit Syria. On the contrary, four or five species are still to be found there, including the Golden Eagle, which is the acknowledged type of its kind. But it is evident that several birds are included in the common title of Asniyeh (translated as Osprey) and that more than one species of Vulture is signified by the word Nesher.

Our own times, unfortunately, have afforded too many illustrations of the text above quoted. Who has not read the "Letters from the seat of war," in the newspapers? Who has not seen the various illustrated journals in which the horrors of war are so graphically depicted? Who can have failed to notice the part which is played by the Vultures? These birds indeed seem, according to Milton, not only to gather together over the bodies of the slain

be they man or beast, but even to foresee the coming battle—

“ . . . As when a flock
Of ravenous fowl, though many a league remote,
Against the day of battle, to a field
Where armies lie encamped come flying, lured
With scent of living carcases designed
For death the following day.” —*Paradise Lost*.

Even in the preliminary stages of the war in the Soudan, before the opposed troops came in contact, it was pitiful to read the accounts of the numberless camels which succumbed to the hardships of the journey, and their inevitable fate when once they yielded to fatigue. A camel, when once fallen, never rises again, and the least cruel mode of dealing with the unfortunate animal is to shoot it as it lies.

It is fortunate for the camel when it falls into European hands, as the natives seem incapable of understanding the signification of humanity to animals. Should an Arab's camel fall when on a forced march, the owner will not trouble himself about the animal, unless he wants to eat it.

In that case, he cuts its throat in the orthodox fashion, at the same time uttering the few orthodox words which render the flesh fit to be eaten by a true believer. Otherwise, he shifts the load of the fallen animal to other beasts, and proceeds on his journey, leaving the camel to die from privation.

The Vultures with their telescope-like eyes can see a fallen camel from distances that render themselves invisible, and from every direction they “ make speed

to the prey," awaiting the sufferer's death. Indeed, they are so impatient with hunger that they begin their attack even before the animal is quite dead, and, so sharp is their sight, that a Vulture which first discovers prey is soon joined by others, until at last the carcase is almost covered with the birds.

If this fate of the camel seems pitiful to us, what must be our feelings when we think of the dead (and perhaps the dying) warriors whose bodies are left to the vultures ? In civilised warfare the victors always search the field of the battle, rescue the wounded and bury the dead, whether they be friends or foes. But in savage or partly civilised warfare the dead of the vanquished are intentionally left by the victors to be devoured by the beasts of the field and the fowls of the air :—

“ Whose limbs, unburied on the fatal shore,
Devouring dogs and hungry vultures tore.”

The fate of the abandoned dead was especially terrible in those days. For it was believed that the spirits of those whose bodies were left unburied were not permitted to enter the dwellings of the dead, but were obliged to wander for ever around the spot where they died. Yet, if but a handful of dust or earth were thrown over the body of a slain soldier, or a little sand cast over the body of one who had been drowned at sea, the requirements of interment were considered to be fulfilled, and the spirit released from its earthly bondage. The classical reader will

call to mind many passages in which reference is made to the all-importance of burial, and the piety of those who found a dead body and reverently cast earth upon it.

Similarly, the Hindoo who considers that the body must be burned in order to enable the spirit to



VULTURES.

enter heaven, thinks that if there be not a sufficiency of fuel to make a funeral pile, or time to consume the body completely, the necessary conditions are fulfilled if even a few sticks be lighted beneath it sufficiently to scorch the skin.

Even we who know that the treatment of the dead body can in no wise affect the eternal welfare of the

soul, and that whether the body be buried in the earth with all funeral rites, consumed to ashes in the fire, cast into the depths of the sea, or devoured by beasts and birds, or even by fellow-men, matters nothing at all as far as the dead are concerned, cannot avoid a feeling of repugnance when we think of a deserted battle-field, and the birds and beasts of prey that gather upon it.

" We met the vultures, legioned in the air,
 Stemming the torrent of the tainted wind :
 They, screaming from their cloudy mountain peaks,
 Stooped through the sulphurous battle-smoke and perched
 Each on the weltering carcase that we loved,
 Like its ill angel."—SHELLEY, *Hellas*.

Yet, there exists a large, important, and peculiarly intellectual race of men, who think that to be devoured by Vultures is the most honourable termination to the life of the body on earth. These are the Parsees of India, popularly but wrongly said to be Fire Worshippers. They pay their worship to the sun, as the highest visible image of the Creator, and in consequence they venerate fire as being the earthly representative of the sun. They shrink with horror from polluting fire, the sacred emblem, with the contact of a dead human body, which they consider as belonging to Ahriman, the creator of matter, just as the departed soul belongs to Hormusd (or Ahura-Mazda), the creator of spirit.

The Parsees, therefore, have a way of disposing of the dead which is peculiar to themselves.

In lieu of burying-grounds or funeral pyres, they

build certain circular edifices called Towers of Silence. These towers are open above, and are furnished in the interior with successive steps made of iron gratings, on which are laid the bodies of the dead. Attached to these towers are the bearers of the dead, who are obliged to keep as much aloof from their fellow men as if they were lepers.

While in America, I came upon a newspaper in which was a singularly interesting account of a Parsee funeral by an eye-witness. I should like to extract it entirely, but limited space will only permit an abridgment.

After mentioning that in consequence of the belief of the lasting impurity caused by the touch of a dead body the dying are always deserted, he proceeds as follows :—

“ A chant reached my ear, and presently a group of men in snow-white garments and turbans entered the gateway, bearing their shrouded burden. They passed silently and very quickly towards the towers. Presently there appeared, twenty yards behind them, another group in snow-pure robes, chanting as they rapidly moved, their chant being very different from any that I had heard about Hindu temples. It was entirely free from minor or whining tones.

“ Everything about this funeral was light, quick, and cheerful, and the singers speedily returned into the garden, where they formed a regular group, and intoned their conversation, occasionally breaking into a chant.

"I listened, gazing at the top of the tower, whereon the body had been deposited and its limbs fastened, face upwards to the sun. Already, at its coming, a circle of Vultures had descended to perch round the parapet, where they sat perfectly still during the presence of the corpse-carriers. The large, lazy, aerial scavengers bore quaint resemblance to gowned and surpliced figures that had once been human.

"The moment when the body was abandoned by its bearers was reported by the slow and dignified disappearance of these birds, which presently rose into the air, each bearing some last contribution of a mortal to the immortal Cosmos."

Returning from this peaceful scene to the battle-field, we find the Vultures proving themselves to be the chief of Earth's purifiers.

Even when all the dead combatants on both sides are buried, there remain the bodies of many animals, such as horses, mules, or camels, according to the geography of the place. These carcases are so numerous, so bulky, and so difficult to bury, that decomposition always sets in before the half of them can be placed underground.

The results to the survivors would soon be as deadly as the weapons of the enemy were it not for the Vultures, who are sure to come when they are wanted. One of the most curious examples of their astonishing instinct was observed in the Crimean war. I need not say that in the neighbourhood of

Sebastopol the Vulture was a very rare bird, from the same reason which has made it extinct in England, namely, lack of food. Yet the war had hardly begun to assume a serious aspect, when the Vultures arrived in ever-increasing numbers, and fed upon the



ON THE BATTLEFIELD.

dead horses. Whence did these Vultures come? Many from Northern Africa, for the Arabs declared that during that war very few Vultures were to be found in the place where they usually abound. Many also appear to have come from Asia, as a similar phenomenon was observed in several parts of India.

There is even a connection between the Vultures and slavery.

Just as sharks follow a slave-ship, so do the Vultures accompany a slave caravan, knowing that many of the captives will break down on the journey, be killed by their captors, should they be in a merciful humour, and in any case, whether dead or dying, be left to be the Vulture's prey.

These birds are most wonderfully constituted for the work which they have to do.

As the supply of food must necessarily be very uncertain, the Vulture is able to exist without food for a very long period. And as, from its nature, the food is perishable, and can only last for a short time, the bird is able to consume an astonishing amount in a short time.

In his "Ornithology of the Sahara," Canon Tristram gives a very humorous account of a couple of Griffon Vultures which were taken from the nest, and had become quite tame. They always watched the operation of skinning birds with the greatest interest, and knew the exact moment when the carcase would be detached from the skin and handed over to them.

One of these birds, "Mucha Pasha," was a general favourite in the camp, and of its exploits in the eating way Canon Tristram writes as follows: "I have seen our pet attack the entrails of a camel, and as its crop became distended, sink upon his breast, unable to stand, till at length, even this position being

too much for him, he lay on his side, still eating, until, overpowered and helpless, he fell asleep. . . .



GRIFFON VULTURE.

"The strength of the Vulture's stomach is equal to its capacity, for on one occasion one of our Griffons devoured a half-pound pot of arsenical soap, with no further inconvenience than a violent fit of vomiting."

The complete absorption of the bird when eating is casually mentioned by Mr. Baldwin in his work on

African hunting. The Griffon Vultures had greatly annoyed the hunting party by pouncing on the game as soon as it was shot, and a young Kaffir lad determined to avenge himself on them.

An elephant had been killed, and the interior removed. The lad crept inside the elephant and awaited the Vultures. As soon as one was busily employed in tearing away the flesh the lad grasped it, rapidly tied its legs together, and secured it by pushing it into the place where the heart had been. Before long he secured another in the same way, and then emerged with his prizes.

Wherever the services of the Vulture are needed there the bird is sure to be found.

"She dwelleth and abideth on the rock, upon the crag of the rock, and the strong place.

"From thence she seeketh the prey, and her eyes behold afar off.

"Her young ones also suck up blood ; and where the slain are, there is she."—Job xxxix. 28—30.

With the Vulture is generally associated the hyæna, which is just as wonderful a purifier as the Vulture. The horny beak of the bird can only deal with soft substances, so that when the flesh was completely cleared from the bones, the skeleton would be left to cumber the earth. But then comes the hyæna, which finds nourishment even in the bones, and by means of its tremendous power of jaw and strength of teeth can crack into splinters even the leg bone of an ox or horse.

Many species of Vulture are to be found in the Old World, and they are represented on the other side of the Atlantic by corresponding species of the New World. There is not the least difficulty in distinguishing a New World Vulture, as the nostrils are completely perforated from side to side, so that a skewer could be thrust through the aperture.

As to size and power, the Lammergeyer and Condor may very well be compared with each other, while the smaller, but not less important, Vultures of either continent are the Egyptian Vulture of Northern Africa, and the Turkey Buzzard of America.

Both birds are so useful that they are protected by law. The former especially is of inestimable value in the Oriental towns and villages, where sanitary precautions are altogether ignored, and any offal, even of the most noisome character, is thrown into the road, and would be left to decompose there but for the Vulture. The bird is perfectly conscious of its immunity from harm, and, insignificant as it is in appearance, looking much like an old and dishevelled white hen, it makes way for no one, and stalks about unconcernedly amid the traffic, searching on every side for something to eat.

There is a popular idea that the Vultures will not eat fresh meat, but will wait patiently by a newly dead carcase until decomposition has set in. This, however, is not the fact, as any Vulture will greedily devour almost any animal substance, whether it be fresh or not; and the Egyptian Vulture in particular

catches and eats a great number of rats, mice, and other creatures which are injurious to agriculture.

As to appearance, none of the Vultures can boast of grace of form or splendour of plumage. But if the old adage be true, that "handsome is that handsome does," the Vultures, which are the acknowledged chiefs of Earth's Purifiers, might claim the foremost rank in beauty.



AMONG THE RUINS.

THE SPARROW ON THE HOUSE-TOP.



XIII.

THE SPARROW ON THE HOUSE-TOP.



OW wonderfully appropriate and epigrammatic are the Scriptural phrases referring to the various living creatures which inhabit Syria and the neighbouring countries !

Such, for example, is the Lion roaring after his prey, or seeking whom he shall devour. Such are the fury of the Bear robbed of her whelps, the gentleness of the Ox bowing his head to the yoke, the agility of the wild Goat among the rocks, the fiery spirit of the Horse, whose neck is clothed with thunder, the destructive habits of the Boar out of the wood, and so forth.

Passing to the Birds, the Scriptural title "Fowls of the Air" is not a mere poetic metaphor, but a scientific truth. Then, among the more conspicuous birds, who does not recollect Job's simile of "the Eagle that hasteth to the prey," or Jeremiah's metaphor, "Though thou shouldest make thy nest as high as the Eagle," together with similar passages scattered

through the Scriptures from the Pentateuch to the Revelation?

The migration of certain birds is touched upon by the prophet Jeremiah, where he says that "the Crane and the Swallow observe the time of their coming." In the "Song of Solomon" allusion is made to the rock-loving nature of the wild pigeon, "O my Dove, that art in the clefts of the rocks," and its powerful flight is maintained in the familiar passage, "O that I had wings like a Dove, for then would I flee away and be at rest." So when mention is made of the Sparrow that sitteth upon the house-tops, the phrase is felt to be equally appropriate.

It is true that the word which has been translated as "Sparrow" is one that is employed in a very vague manner, and that it may be applied to almost any small bird. In one passage, indeed, where the Sparrow is represented as being alone on the house-top, it is evident that the sacred writer could hardly have referred to the bird to which the name of Sparrow is now restricted. Even among ourselves we use the term "White-throated Sparrow" to designate a bird which belongs to a different genus, and the "Hedge Sparrow" as the name of one of the Warblers, a group which is far removed from the Sparrows.

Indeed, so indifferent are the generality of mankind to objects around them, that the average inhabitant of the country, where every opportunity for observation is afforded, cannot distinguish one small

bird from another. The redbreast and the wren he may perhaps know, though he is often apt to think that the "Jenny Wren" is the wife of "Cock-Robin." But suppose that the hedge-sparrow, the woodlark, the siskin, the green linnet, the red-poll, the



THE ROLLER BIRD.

(One of the birds known as "Sparrows" in Palestine.)

chaffinch, the white-throat, the dipper, the nuthatch, the wryneck, the fly-catcher, and the creeper were put before him, the ordinary rustic would lump them all together as Sparrows.

So we need not be surprised that the same Hebrew word should be used as designating a variety of species, or that in more recent times the Greek word *Strouthos* may signify a sparrow, an ostrich,

or one of the plants which we popularly call soap-worts.

However, the true Sparrow is plentiful in Palestine, and is even more a denizen of the house-tops than with us. In this country the Sparrow mostly frequents the house-tops because it finds there convenient places for its nest. But in the East, where houses are built on totally different principles from those of Western countries, the Sparrow can procure food upon the house-tops as well as find a locality for its nest.

If the reader will refer to our illustration of an Eastern town, he will be struck with the different character of the architecture. Instead of our lofty and gable-roofed houses, with their sides pierced for many windows, we see a collection of square, low, flat-roofed edifices, with scarcely a window to be seen on the exterior, and looking very much like a miscellaneous set of magnified packing-cases.

The fact is, that architecture is necessarily influenced by climate. In our country, where the greater part of human life is passed within our houses, we want to admit sunshine and air into our homes. But in the hotter latitudes of the East human life is spent almost entirely in the open air, and the houses can scarcely be called "homes" in our sense of the word. They are used as temporary shelters, but chiefly as resting-places for the night. Even for the latter purpose they seem to our eyes sadly insufficient. Indeed, an English housemaid would refuse to accept

a situation if she were offered a bedroom which is thought quite good enough for the highest and wealthiest Eastern noble.

Houses are there built for the purpose of excluding



EASTERN HOUSE-TOPS.

the sun, not of admitting it, and are therefore made with very thick walls and roofs. The latter are composed of a framework of solid beams, upon which is placed a thick layer of brushwood, and upon the

brushwood a heavy coating of earth which has been first wetted, and then beaten or rolled until quite hard. Seeds of various kinds, especially grasses, are included in the earth, and so help to supply food for the Sparrow. So, were it only for the purpose of obtaining food, there is good reason why the bird should frequent the house-tops.

The very fact that it does so shows that the instinct of the Sparrow teaches it to cling to man ; and this instinct has been noticed by the sacred writers. Its habits of building in houses is indicated by the Psalmist, "The Sparrow hath found an house, and the swallow a nest for herself where she may lay her young, even Thy altars, O Lord of hosts."

A very familiar example of the instinct which makes the Sparrow a companion of man is to be found in the Crystal Palace. There these birds have firmly established themselves, and there must be hundreds of them who have only seen the world through glass windows.

Sparrows, as a rule, are very clever birds, but when they accidentally get into a building they, just as bees do under similar circumstances, fly wildly about, and seem quite incapable of distinguishing between a glass pane and an open window. Dead Sparrows are frequently found in churches, having been starved to death, and when an old organ is removed from a public building the withered bodies of sparrows are often discovered in the large pipes.

The birds have gone into them in hopes of obtaining food, and, of course, have been unable to fly up again, the place being too narrow for the free play of their wings.

But in the Crystal Palace, which is full of refreshment-rooms, there is no lack of food for the Sparrows, and in consequence they thrive wonderfully.

One remarkable point among the Crystal Palace Sparrows is, that they are perfectly capable of distinguishing between the casual visitors and the season-ticket holders. Of the latter they take no notice, but as soon as a number of visitors enter, especially if they come from the country, the Sparrow has its eye upon them. The bird knows well enough that sooner or later the visitors will take refreshments, and means to have its share of the repast.

The self-possession, not to say audacity, of the Crystal Palace Sparrow is simply amazing. It will hop about among the feet of the visitors who are sitting at the table, pick up the fragments which they throw to it, and all but eat out of their hands. Jam tarts seem to be perfectly irresistible to the Sparrow, and if there should be a jam tart on the table, and the attention of the rightful owner should be diverted for a moment, a Sparrow will in all probability make a sudden dash, and then fly off with its beak full of jam.

Its courage in levelling contributions among the guests is the more remarkable because it has to keep a look-out for the Crystal Palace cats, which are

greatly petted in the building, and which haunt the refreshment departments for the same reason which attracts the Sparrow. Yet, though I have been daily in the Palace for some seven years, I never saw a Crystal Palace cat catch a Crystal Palace Sparrow, and, although I have asked many of those who are regularly employed in the building, I never found any one who had seen such a feat performed.

In the autumn of 1879 I witnessed a singularly interesting sight.

A sort of harvest fête was instituted, and in the centre of the building an enormous trophy was erected, emblematical of the "kindly fruits of the earth." I think it was about fifty feet in height, and it was crowned with a gigantic wheat-sheaf almost large enough to deserve the name of wheat-stack. Ordinary sheaves of wheat, barley, and oats and other grain were artistically disposed about it.

The Crystal Palace Sparrows knew all about it. They silently assembled from all parts of the building, and sat in rows on the ties and girders, just as swallows assemble before migration. The multitude was simply wonderful, and until that time I had no idea of the army of Sparrows that inhabited the building. As long as the workmen were engaged on the trophy not a sparrow approached it. But no sooner was the scaffolding removed, and the last poles and planks wheeled away, than the Sparrows precipitated themselves upon it in a cloud that hid all the sheaves from sight, and in an hour I very

much doubt whether a single grain could be found in any part of the trophy. I did see it taken down, and know that every ear, whether of wheat or any other grain, was absolutely empty.

Wherever food can be found there will be the creature that needs it. "Where the carcase is, there will the eagles be gathered together," and where no carcase is to be found, the eagles (or vultures) disappear. In our own country, for example, the raven and the kite were so common as to be the dread of poultry-keepers. At the present day a poultry-keeper, or even a farmer, would scarcely know a kite if he saw it, while the raven, except when domesticated and kept as a pet, is almost as scarce as the eagle itself.

The Sparrow affords a curious example of the working of the ceaseless miracle by which food is given to all flesh.

Not many years ago the London street-sparrow was a bird almost unique. The streets were full of the birds, which perched upon the house-tops and window-sills, watching for food. The incessant traffic of the street did not in the least disconcert them, and, indeed, the more crowded were the streets, and the more busy the traffic, the more in its element did the Sparrow seem to be. It hopped and fluttered under carts or carriages, treating with equal indifference the slow-rolling waggon or the swift-wheeled Hansom cab. It was quite at its ease among the hoofs of horses, while it treated foot-passengers with

supreme contempt, scarcely troubling itself to get out of their way.

At the present time the London street-sparrow has almost vanished from the busiest thoroughfares where he was once supreme, and where a thousand Sparrows might be seen in former days, scarcely one is now visible. The reason is simply that there is nothing for him to eat. The useful corps of street-cleaning boys suffer no refuse to remain in the streets, and even should a fragment of biscuit or bun be thrown away it is swept up by the ubiquitous boys before the Sparrow can reach it.

It may seem rather a strange thing to say, but I never look at those boys without thinking that they bear a strong resemblance to the birds whose task they have taken upon themselves, and performed more effectually.

Like the Sparrow, they seem to possess some charm which protects them from the danger of the streets. No matter how busy may be the traffic, one of these boys will dash among the hoofs and wheels as confidently as if the street were empty. At intervals you catch glimpses of him stooping and dodging under horses and among wheels, though encumbered with laden shovel in one hand and brush in the other, and presently he will emerge on the other side of the street with a grin on his countenance as he throws a word of banter to an acquaintance.

The result of his labours is, however, that he has banished the Sparrow from the main thoroughfares,

and driven him into the markets and smaller streets, where no cleaning-boys deprive him of his living.

Let us follow the Sparrow into the country.

Up to comparatively late years the Sparrow was admitted to be one of the many noxious creatures which afflict the agriculturist, and therefore ought to be destroyed. In the vestry books of many a country village may be seen among the regular annual expenses certain sums paid for Sparrows' heads and eggs. Putting aside the fact which I have already mentioned, that the average farmer considers nearly all small birds to be Sparrows (just as the average Chinese mandarin lumps together the English, French, German, Spanish, Italian, American, and other white races under the comprehensive title of Fan-qui, or foreign demons), the life-history of the Sparrow is absolutely unknown to either farmer or labourer.

The farmer or gardener knows that the Sparrow is a robber of his grain and a ruthless plunderer of his peas. Therefore he assumes that the bird is equally destructive at all times of the year, and tries to destroy as many of them as he can, especially in the spring time, while they are engaged with their nests and young. He does not know that there is a time when the Sparrow ought to be cherished, and a time when he ought to be banished.

When the sparrow is full-grown its beak is hard, as the bird is intended to live chiefly on hard seeds, especially those which we call by the name of grain. Yet it likes to vary its diet with smaller seeds, such

as those of various thistles, dandelions, and similar weeds, and will eat many insects which we acknowledge to be injurious to the agriculturist. Therefore the Sparrow may well be driven away from the fields and gardens after the end of summer. Indeed, as it furnishes excellent food, there is no reason why it should not be utilised for that purpose, like many other birds. "Are not two Sparrows sold for a farthing?" Yet the rustic who complains that he never gets meat from one Sunday to another will catch the birds for sale to "sparrow-clubs," cut off the heads, and make no use of the bodies. Worse still, he will sell them alive to sparrow-shooting clubs, institutions which, like pigeon-clubs, I hope to see subjected to the same laws which have erased dog-fighting and bull-baiting from the list of British sports.

There is, however, a time when the Sparrow is the best friend of the agriculturist, and that time extends through the whole of the breeding season, *i.e.* from March or April, according to the temperature, up to the end of summer. For the beak of the young Sparrow is soft, and its digestive organs are quite incapable of assimilating the grain and other seeds which form its nourishment when it is full-grown. Caterpillars, grubs, and similar destructive creatures are the only food which the young Sparrow can eat, and throughout the day the parents are busily employed in searching for food and bringing it to their young. On an average, a pair of Sparrows will take home about one grub in each minute, and will con-

tinue to perform this task throughout the whole working day. It is impossible to overrate the value of this work, especially when we call to mind that if the insects which were killed as caterpillars, or grubs, or "worms," had been allowed to live, many of them would have produced thousands of young to carry on their destructive work.

This, however, the average agriculturist does not know, and if you tell him he will only laugh at you. The stupendous ignorance and dense obstinacy of the tillers of the soil, whether masters or men, are absolutely appalling, and can hardly be realised except by living among them.

Not long ago a remarkable communication was made to a newspaper. An old farmer had specially cultivated lettuces for sixty years, and had suffered much loss from the ravages made among them by the great hairy caterpillar, which is popularly called the "woolly-bear." This caterpillar is the larval form of one of our largest and most conspicuous insects, called the Tiger Moth. It is thick-bodied, measures about two inches across the wings, is almost obtrusive in its hues—scarlet, black, and cream-colour—and is one of the commonest of our insects.

Yet this old farmer had been cultivating his lettuces for sixty years before he ever saw a Tiger Moth. When he at last did see one, he sent it in a box to the vicar of the parish as a great curiosity, and, being a kindly man, he put some lilac-leaves in the box for it to eat. So here was a man much over eighty

years of age, who had lived in the country all his life, who actually thought that moths could eat leaves, who had no idea that the moth had any connection with the caterpillar that ate his lettuces, and who had lived until he had passed the age of fourscore years without seeing one of the moths that in his fields must have been as common as blue-bottle flies in a butcher's shop. Commenting on the case, a correspondent of the *Globe* newspaper made the following pertinent remarks :—

" Apart from bad weather, the farmer's worst enemy has been his own ignorance. He goes on year after year quietly submitting to the decimation of his crops by insects, birds, animals, and weeds without so much as endeavouring to find out the nature or even the names of his enemies. In commercial matters such persistent ignorance would be simply ruin, for no tradesman or mechanic could hope to make headway in the struggle for existence if he thus allowed the commonest difficulties and impediments to his craft to remain unnoticed and unremedied."

Another phase in the life history of the Sparrow is now forcing itself on public attention, namely, its influence on lands foreign to itself.

Naturally it is an Old World bird, being found in all parts of Europe, together with portions of Asia and Africa. But of late years persons who appreciated the value of its services in its own lands thought that it would perform the same good offices

on other shores, and so transplanted it across the Atlantic and Pacific. Taking America and New Zealand as the most conspicuous localities of its transportation, we find that unexpected results have followed.

In America it signally failed in the object for which it was imported. The fault, however, did not lie with the bird, but with the ignorance of those who counselled its importation. Many parts of the United States suffer greatly from the ravages of a caterpillar which is popularly called the "canker-worm," and is terribly destructive to trees. It almost exactly resembles the caterpillar of the common Vapourer Moth (*Orgyia antiqua*) of this country. It is a large-bodied caterpillar, and singularly beautiful, being covered with tufts of long, stiff, brightly coloured hairs.

Having in their mind some confused idea that Sparrows ate caterpillars, these zealous acclimatisers thought that the Sparrow was just the bird to deliver them from their dread canker-worm! They forgot the size of the full-grown canker-worm, and that its panoply of bristle-tufts forms a defence against any bird except the European cuckoo. They also forgot that the Sparrow when adult is not an insect-eater, and that it could not feed its young on the canker-worm, because a full-grown canker-worm is much larger than a newly-hatched sparrow.

The result has been that the canker-worm remains as it was, while the Sparrow has spread all over the

country, and being wonderfully hardy—I saw them in January, 1885, hopping about merrily in North Wisconsin in a temperature of forty degrees below zero—combative, and possessed of indomitable courage it has ousted many of the native birds, and usurped their places. One day while I was walking across Boston Common with an American friend, we were remarking on the fact that not a native bird was to be seen there, and my friend observed that if the American Eagle were to settle on the common the English Sparrow would drive it off. I believe that he would. He certainly would try.

The Americans now complain bitterly of the "English" Sparrow, as they persist in calling it, and I saw in an American paper that sparrow-clubs were being formed for the purpose of exterminating the little intruders. I do not think, however, that the Sparrow really does any harm, except from a sentimental point of view, as his young must be nourished on insect food whether they be hatched in America or in England. Even as a matter of sentiment, the Sparrow in America has his good points. A correspondent of the *New York Sun* newspaper writes of him as follows:—

"I detest the English Sparrow as a bird wholly depraved, a robber, a brigand, a pirate, and everything that is bad, yet cannot forbear to give him credit as a most ingenious creature, the equal of many and the superior of most of our native varieties in respect to intelligence. I saw one of these the

other day perform a feat which entertained me greatly.

"He had found in the road a long strip of cotton cloth, which his intelligence seemed to tell him was admirably adapted for purposes of nest-building. Confidently, then, he seized one end of it in his beak, and flew away with it. Soon, however, the wind blew the long streamer about his wings and brought him tumbling into the dust. He picked himself up, shook himself, and seizing the rag *by the other end*, made a second attempt, which resulted as disastrously as the first. Then he seized the strip by the middle, but this time he was entangled more quickly than before, and brought to earth before he had risen to the height of a yard. He then squatted down panting, regarding the rag malevolently, yet apparently determined to overcome the difficulties which it presented.

"Presently his appearance changed; an idea had evidently struck him. He hopped briskly up to the cloth, and with claws and bill rolled it into a compact ball. Then he drove his beak into it, shook his head once or twice to assure himself that the ends were secured, and flew briskly away, reaching his distant box in safety. If ever bird reasoned this Sparrow did, and I have no doubt that they all do reason, and very profoundly, too, at times."

I might say much more from personal recollections of the Sparrow in America, but lack of space forces me to pass to the Sparrow in New Zealand, where,

according to Miss Gordon Cumming's account, the bird has become a positive plague to the colonists.

Some years ago fifty Sparrows were imported, and rapidly increased, so that they have overrun the country. Like the Kea Parrot, which abandoned vegetable food and took to eating sheep, the Sparrow has changed his diet, but in a reverse direction. He has become a total vegetarian, and lives wholly on grain and fruit. In ten days one fruit-grower had five fig-trees completely stripped of their fruit and a ton and half of grapes eaten. How to cope with these winged plagues no one knows. Shooting can make but little impression on their vast numbers, while they flatly decline to go into traps or eat poison.

The importation of the rabbit into New Zealand produced similar results. In 1860 seven rabbits were turned out. Twenty years afterwards seven million skins had been exported, one proprietor having killed more than one hundred and eighty thousand, and yet the number continued to increase to such an extent that one landowner was forced to abandon a sheep-pass of two hundred and fifty thousand acres.

From these experiences we may infer that He who made birds and beasts knew where to put them, and that although the Sparrow may be a valuable ally when he is in his place as companion of man in the Old World, he may be very much out of place when man interferes with the balance of Nature and transports him into countries where he has no business.

BY THE RIVER.



XIV.

BY THE RIVER.

1.—THE KINGFISHER.



ICH river?

Almost any river, providing that it be far from towns or even villages, and that its banks be fringed here and there with trees, brushwood, reeds, and herbage which love the river's bank.

Let us pass a day in walking quietly along the river-side, and noting the animal life with which we shall meet. As a river simply teems with life, we cannot take notice of every living creature which we may see, but will content ourselves with the birds and those creatures which are directly connected with their life "by the river."

We shall not trouble ourselves to cover any great distance during our day, because a quick step will frighten away almost any bird which haunts the river-side. Moreover, what we want is observation, and not mere walking, and so we will saunter slowly along

the bank, stopping here and there when any object takes our attention. From six to eight miles are amply sufficient for such a walk, and within that distance we shall be tolerably sure of finding sufficient variety for our purpose.

Scarcely any river retains precisely the same character for a very long distance. For example, a swift and rippling river, such as the Dove or Trent, which



dashes over its stony bed in foaming wavelets, and curls itself into eddying whirlpools—

“ With here and there a lusty trout,
And here and there a grayling,”

will, in the course of a mile or so, expand into a deep, black, still pond, on whose smooth bosom the water-lily spreads its broad green leaves, interspersed with the starry white flowers. *Vice versa*, within the course

of six or seven miles, the geological features of the country may change, and the slow stream be forced for a while to rush tumultuously over its suddenly altered bed.

Unknown rivers are full of surprises, and the explorer is perpetually coming on some pool or eddy or heavily shaded nook of which he had no idea.

Should he have the use of the oar, he should first walk up the river, and then let himself drift gently down stream, scanning carefully the sheltered banks, and only using the sculls sufficiently to keep the boat under control. Rowing up the stream has the disadvantage that a certain amount of exertion is needed, varying according to the strength of the current, so that it is almost impossible to make any progress without alarming the birds.

A good opera or field glass is more than valuable. Magnifying power is not so much wanted as clearness of definition, especially when the observer wishes to watch birds which, like the water-hen, are fond of slipping away under cover of the thick herbage that shades a river's bank.

There are not many British birds which find their living near or in the water, and it is not easy to assign to any one of them the pre-eminence. I think, however, that, considering its food, its beauty, and its wonderful nest, we may safely give the first place to the KINGFISHER (*Alcedo hispida*).

Kingfishers are spread over the greater part of the earth, and we may be proud of the unexpected fact



HAUNT OF THE KINGFISHER.

that our own species far surpasses in splendour of colouring the King-fishers of the tropics.

Though it never takes a long flight, it is wonderfully swift of wing, and flies in a straight, horizontal line, like an azure rifle bullet. Indeed, when it passes through a ray of sunshine, it looks more like a line of coloured light than a bird. This effect is strengthened by the very remarkable form of the bird, the tail being very short, and the head and beak nearly equal in length to the whole body. The colouring is marvellously beautiful, and seems as if it ought to belong to some inhabitant of the tropics. The back is a rich blue, while the head and wing coverts are verditer green, diversified with

blue spots. This contrast of blue and green would seem most hazardous to a painter ; but in the King-fisher they blend together in perfect harmony. The wings and tail are blue-green, while the throat is white, and the breast and under surface are red.

Contrary to the usual habit among birds, both sexes are equally beautiful. Owing to this magnificent colouring the Kingfisher's skin is in much demand, both as an ornament for ladies' hats and dresses and as affording materials for the makers of artificial flies. But our mission "by the river" is not to destroy, but to observe and admire ; not to take away the life which we can neither give nor restore, but to look with reverent curiosity upon the beautiful creature, and be thankful that it is so beautiful.

As its popular name implies, the food of this bird is fish, which it takes after its own remarkable fashion.

In every river or brook there are always certain spots, mostly shallows, which are frequented by the small fish, such as minnows, bleak, young dace or roach, and the like. These fish are in the habit of keeping near the surface of the water, so as to be ready for flies or other insects that may fall into the water.

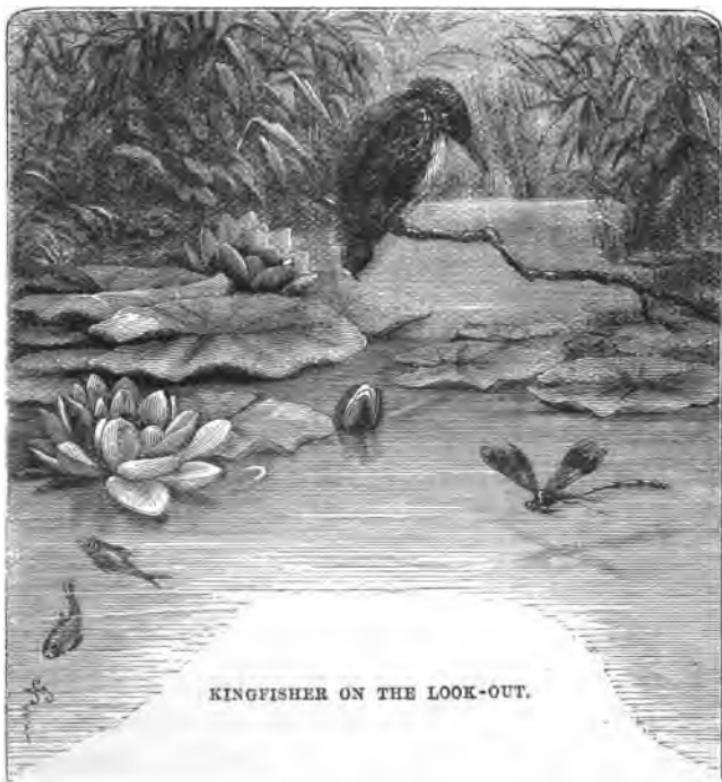
Taking its place on an overhanging branch or other commanding perch, the bird waits until a fish comes to the surface, drops down upon it, and after a short struggle emerges from the water, carrying

the fish crosswise in its beak. Returning to its perch it bangs the fish violently against the branch, so as to kill, or at least to stun it. Then, flinging the fish in the air by a quick jerk of its head, it catches its prey with its head downwards, and swallows it whole.

It is a wonderfully bold bird, and if the observer will keep himself absolutely quiet, will catch and eat its prey within a few yards. Should the reader have access to any stream or river which is inhabited by the little fish which have been mentioned, he can easily attract the Kingfisher. All he has to do is to fix in the bank a stout post or tree-stump projecting over any shallow place where the fish must be near the surface. Should a Kingfisher happen to reside anywhere in the neighbourhood, very few days will elapse before it discovers so good a fishing-place. Then, by a little judicious management, the bird will soon become so familiar that it will take no heed of a bystander, but will behave as if no human being were within many miles.

When I was at Oxford I was on quite friendly terms with a Kingfisher that frequented a little branch of the Cherwell River. A private bridge spanned the stream, and a stone buttress, which supported the end of the bridge, was a favourite resort of the Kingfisher.

Separated from the bird only by a dwarf wall not more than four feet in height, I have leaned against the wall just over the stone, and so close to it



KINGFISHER ON THE LOOK-OUT.

that I could almost touch it with my fingers. Yet after a while the bird (or perhaps I might say the birds, the sexes being so much alike) flew to the stone without the least hesitation, and watched for prey, or banged it to death against the stone, so close to me that I could almost have snatched the fish out of the bird's beak.

Its nesting is as remarkable as its feeding. The eggs are always laid at some distance within a hole in a bank, mostly the deserted burrow of a water-rat.

I have, however, found the nest in a hole fully half a mile away from water. A convenient portion of the burrow is enlarged by the bird, and the eggs are laid upon a mass of fish-bones, which serve to keep them from the damp earth. These bones are due to the predacious nature of the Kingfisher.

It is the custom of the predacious birds to swallow the feathers, fur, skin, bones, or scales of their prey. The soft portions are then separated from the rest in the stomach, and allowed to pass into the assimilative system. The indigestible parts are formed into oval balls, or "pellets," as they are usually termed, and thrown up again.

It is easy, by inspecting these pellets, to ascertain the food of the bird.

Thus in the pellets of the owl are found the bones and skins of mice, together with the shards, wings, and legs of the cockchafer, june-bug, and other destructive insects. Those of the Kingfisher show that when the bird lives near the sea it will feed upon marine fish, which it can capture at low water in the rock-pools, and that it does not disclaim to add shrimps and prawns to its viands.

When hawking was in fashion, the falconers always paid the greatest attention to the "castings," as these pellets were called, and regulated the character of the food accordingly.

Those of the owls are allowed to lie at random on the floor of the nest, or rather of the nesting place, and upon them the eggs are laid. But those of the

Kingfisher are arranged in a circular form, though without any particular art.

That they are so arranged was proved by the late Mr. J. Gould. It is so difficult to procure an uninjured Kingfisher's nest that some years ago a legend was current to the effect that any one who would take a perfect nest to the British Museum would receive a hundred guineas for it. A similar legend existed with regard to Queen Anne's farthings, and it is worthy of notice that the use of the term "guineas" instead of pounds shows that both legends were invented before the present twenty-shilling piece had been designed.

Mr. Gould did succeed in depositing a perfect nest in the British Museum, but he certainly never asked or would have obtained the legendary reward. His account of the ingenious manner in which he obtained the nest is most interesting, but much too long for insertion. I shall therefore give a brief epitome of it.

Having, by means of his fishing-rod, measured the distance of the nest from the entrance of the burrow he dug down upon it, so as not to injure the burrow itself, and found four eggs, which he removed, together with the bones on which they rested, and he then filled in the hole which he had made.

After waiting for twenty-one days he took a quantity of cotton wool to the spot, and with it filled up the entire burrow, stuffing it in with the fishing-rod. He again dug down upon the nest, and there found eight eggs, the female bird, and a renewed nest. The

cotton wool had performed the double task of capturing the mother bird and keeping the loosened earth from falling into the nest and spoiling it.

A small plate was then introduced beneath the nest, which was thus removed in perfect condition. As Mr. Gould had previously taken away not only the four eggs, but the bones on which they were resting, it is evident that the bones, &c., which composed the nest must have been deposited within twenty-one days.

Considering that the Kingfisher lays eight eggs at each brood, which is nearly double the usual average, it seems rather remarkable that the bird should be so scarce. True, it is—though bold when it knows that it will not be injured—a shy bird, never showing itself more than it can avoid. It lives in pairs, and, as far as I know, two pairs never nest within a considerable distance of each other.

The eggs are beautifully white, having, when fresh, a pinkish hue, which vanishes when they are emptied, leaving them white, with a shining gloss. The colour can be restored so perfectly that if a number of restored and fresh eggs be mixed together no one could distinguish between them. The process of restoration is too elaborate for description.

The bird is a very prolific one, and when a nest has been discovered it is easy to obtain five or six eggs, and yet leave the bird her eight eggs for hatching.



BY THE RIVER.

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2.—THE HERON.

F the observer be fortunate he may manage to steal upon a HERON (*Ardea cinerea*) as it is standing in the shallow water and looking after fish. These it takes with a quick stroke of its snake-like head and neck. Like the kingfisher, it throws its prey into the air, so as to catch it with the head downwards, but it does not trouble itself to beat it against a stone or branch before swallowing it. An eel, however, can seldom be swallowed without being beaten to death.

Large as is the Heron it is not easily seen, as the grey tints of its plumage harmonise exactly with the shadows in which it mostly stands. Even if the sun should be shining the Heron is little more visible, owing to the singular fact that the ripples of the water, flecked with the sunbeams, are reflected on the breast of the bird so perfectly that the bird and water are



THE HERON IN HIS SOLITUDE.

is no need for any such attraction, the keen eye, active neck, and long, sharp beak requiring no extraneous aid.

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blended together as if they were one.

Then the attitude of a watching Heron is most singular. The bird is quite motionless, sinks its head upon its shoulders, and, especially when seen from behind, looks more like a grey pegtop than a bird.

Many absurd ideas were once prevalent about the supposed attractiveness to fish possessed by the Heron. It was thought that a sort of fragrant oil exuded from the Heron's legs, and that the fish were attracted by its odour within reach of the beak. There

Moreover, the Heron does not depend entirely on fish for its food ; it feeds largely on frogs and toads, so that it would make as inconvenient a king for the frogs as King Stork himself. It also eats water-rats, killing them as they pass inadvertently near it by a single blow from the pointed beak on the back of the head.

Many years ago the late Charles Waterton was obliged to drain several fish-ponds, and turn them into fir plantations, because the water rats bored the banks so full of holes that the water was continually escaping. Shortly afterwards a number of Herons established themselves in the grounds of Walton Hall, and soon made short work of the water-rats. Waterton used to say that if he had only known the intentions of the Herons beforehand he would not have gone to the expense of draining, and might have retained his fish-ponds.

Walton Hall afforded peculiar facilities to those who wished to watch the habits of the Heron, or indeed of any water-haunting bird.

From long immunity the birds were so tame that they allowed themselves to be approached quite closely. Moreover, a powerful telescope was always kept mounted on a stand in the drawing-room window, which overlooked the lake, in the middle of which is the rocky island on which the house is built. To this telescope was owing the discovery of the fact that, contrary to all preconceived opinions, the Heron was able to swim.

Mr. Waterton long disbelieved the statement, and was not sparing of his sarcasms upon the benighted individuals who dared to tell him that they had seen a Heron swim. Dr. N. Moore, in his biography of Waterton, has the following passage :—

“It is commonly said in books on ornithology, that ‘Heron neither swim nor dive’” (Waterton himself had used these very words in his essay on the Heron). “I have known them do both. One August when I was looking at a Heron, it disappeared under water for full half a minute, at a



HAUNT OF THE HERONS.

spot where the lake was from six to seven feet deep, and, on coming up, it rose to the surface, and flew away. In the following September, on a sultry evening, when the fish were jumping, I saw a Heron with outstretched neck, swimming this way and that, in the middle of the lake. I watched it for five minutes, when it took flight from the water where it was swimming."

No amount of evidence except that of his own eyes could have convinced Waterton that the Heron was a swimmer. However, the telescope settled the question, and he at once wrote to acknowledge the fact, as see the following extracts :—

"*Herons.*—When the weather is calm, and the water warm, here at Walton Hall, the Herons will alight on the deep water, and swim just like water-hens. This repeatedly took place for many days in the month of June, 1846. I saw the Herons, after they had alighted on the deep water, strike at fish, but could not perceive that they succeeded in capturing any."

Another extract from a letter puts the case even more strongly.

"The present warm and calm weather has produced to me a new phenomenon in ornithology.

"The Herons, which have increased and thrown aside much of their natural shyness, are perpetually alighting on the deep water before the drawing-room window. I watch them narrowly through the telescope, and it seems to me that these waders venture beyond their depth in the hopes of getting at the

fish, which are in innumerable shoals on the surface. You can conceive nothing more awkward than the gestures of the Herons. They try and try again ; and apparently they do not succeed in capturing a single fish. After many trials, they rise from the water exactly as the water-hen does.

"This is the first time that I ever saw the Heron progressing through deep water. We live to learn." With the last observation I entirely agree. It is the motto of a true naturalist, and should animate us as we walk "by the river."

On account of its fondness for water-rats, the Heron is often an unconscious ally of the kingfisher, killing the rat, and so leaving its burrow for the use of the bird.

Though the Heron may be seen by the river, its nest may be, and probably is, from twenty to forty miles away. Herons, like rooks, congregate together, and make their nests in similar fashion, constructing them of loose sticks, and placing them on the top-most branches of trees. Also, like the rooks, they are very fastidious about their nesting places, so that although they can easily be annoyed, and will take themselves off in dudgeon, it is almost impossible to attract them.

Mr. C. Waterton's herony afforded an excellent example of this capriciousness.

He had for many years been longing for a herony within his grounds, but could not, with all his fertility of invention, hit upon a plan of attracting the



HERON'S WING.

birds. One year he found himself the unexpected possessor of a heronry. He had for some years been engaged in the task of building a wall round a large portion of his property, having the house nearly in the centre. As the wall was only erected with the surplus funds of the estate, several years were occupied in building it. On the very year after it was finished the Herons came and built their nests in the trees.

In connection with these nests, I may mention that the older works on ornithology used to state that the long legs of the Heron incapacitated it from sitting on the nest in the usual way, and that it was obliged to bestride the nest, like a man on horseback, and allow its legs to hang down on either side.



FLYING HERON.

This notion is entirely absurd, the Heron being able to double up its legs and sit on its nest as well as any other bird, as I have often witnessed.

Owing to its enormous wings, and the little weight which they have to carry, the Heron thinks nothing of flying twenty or thirty miles for its food. When it does so, it always flies at a height so great that it

mostly escapes notice altogether. Even if discovered, it is perfectly safe, as the only bird which would be likely to attack it, namely, the peregrine falcon, is now seldom seen, and when it does make its appearance, contents itself with easier prey than the active, high-soaring, and fierce Heron, whose beak the falcon holds in well-deserved respect.

That spear-like beak is dangerous even to man, the bird always aiming at the eye, and delivering its stroke so swiftly that the sight can scarcely follow it.

The Rev. C. A. Johns mentions, in his work upon British birds, that a tame Heron used to sit on an old carriage wheel in a court yard, and watch for sparrows and martins, catching even the latter birds by a sudden dart of its beak. As soon as it had caught a bird it used to proceed to its water-trough, plunge its prey several times under water, and then swallow it whole. When the bird is within convenient distance of the sea, it visits the shore at low water, and picks up the fish, crabs, shrimps, and other sea-side animals.





3.—MISCELLANEOUS.



HAT are those little balls of black down that are bobbing about among the water-lily leaves? They are the young of the WATER-HEN (*Gallinula chloropus*), sometimes called the moor-hen.

If the history of this bird were not known very few persons would take it for a water bird, inasmuch as its feet are not webbed. But the toes are so long that they answer the purpose of webs, and enable it to swim and dive as well as if it possessed webs like that of the ducks and geese.

Those who know its ways have little difficulty in watching the Water-Hen, while a novice will be surrounded by the birds, and not see one of them. Then, even when the bird has been detected, it is no easy matter to keep it in sight. I know no bird which is a greater adept at concealing itself, when, like Falstaff, it "would not be seen." It has, how-



WATER-HEN AND YOUNG.

ever, a greater talent for hiding itself than was possessed by Falstaff, and employs a variety of wiles wherewith to deceive the foe.

One of its favourite devices is to dive and then swim some little way under water until it comes to weeds. Then it grasps the weeds with its long toes so as to keep its body under water, while it thrusts the beak out of the water just far enough to allow itself to breathe.

Then it will take advantage of a shady bank, and crouch under its shelter, the broken lights and shadows harmonising so well with its mottled plumage, that even when pointed out it has often escaped the notice of unaccustomed eyes, though the bird was crouching within a few yards. If it should find concealment useless, it springs from the surface of the water and takes to wing, always flying very low, and letting its long feet trail behind it.

Near Oxford the Water-Hen is exceedingly common, and I have had many opportunities of watching its habits.

When a river happens to be the boundary of a garden, as sometimes happens, the Water-Hen will take advantage of the situation, and will make sad havoc among the early crops, both of fruit and vegetables. Should poultry be kept, the bird will mix with them in the most friendly manner, and will affably partake of their food, as if it were one of themselves, as I have seen in Sussex.

The nest of this bird is always placed on the bank

of the river, and is a large mass of sedges, grass, small sticks, and similar materials. Mostly it is situated on the very edge of the water, but instances are known where it has been placed at some little distance from the water, or even on the top of a pollard willow which overhung the river. Of those seen by myself—and they are very many—the most have been made with the farther edge actually resting on the surface of the water. There are usually seven or eight of the buff speckled eggs in the nest.

When the mother bird leaves them she covers them over with the same materials as those of which the nest is composed. This is not for the purpose of keeping them warm, but to hide them from the egg-eating birds, such as the crow and the magpie.

When the nest is made inland, or on a tree, the young are carried to the water by the long feet of their parent. When first hatched they are mere puffs of black down, but they soon assume the grey plumage which lasts them until they put on the olive-brown and white of the adult bird.

The beak is red, and a horny patch of the same colour extends from the base of the beak to the forehead.

Not unlike the Water-Hen is the Coot (*Fulica atra*); its movement in swimming and walking being almost identical.

It can be identified, however, by the horny patch at the base of the beak, which in the Coot is white instead of red, and very conspicuous, even at some



THE COOT.

distance. When the water is still, the effect of this white patch is very remarkable. Being reflected in the water as the Coot swims along, nodding its head at every stroke of the feet, it looks exactly as if another white patch were rising from the water to meet it at every nod.

The nest of this bird is not so easy to find or reach as that of the water-hen, as it is placed among reeds or sedges at some distance from the bank, and cannot be reached except by a boat, or by wading. I have found great quantities of Coot nests in the

Swindon reservoir. Indeed, the Coot prefers lakes and ponds to rivers, and does not frequent the latter unless they be very still, shallow, and retired.

It is just possible to catch a glimpse of that shiest of birds, the WATER RAIL (*Rallus aquaticus*), but not very easy, owing to the singularly retiring habits of the bird and its inconspicuous brown and black plumage.

It is mostly to be found on the banks of streams, feeding upon the insects and other small creatures which love the neighbourhood of water. The Rev. C. A. Johns mentions that he once saw several of these birds in the depth of winter hunting for food by a little stream, the rapidity of which had kept it from freezing. He suggests that he was probably indebted for so unusual a sight to two causes, one being the hunger consequent on a severe frost, and the other the well-known fact that many shy birds will allow a vehicle to approach them, while they will take alarm even at the distant sight of a human being on foot.

The slow, sheltered waters which please the coot are equally agreeable to the active DABCHICK (*Podiceps minor*), a bird which has many titles. To the scientific it is known as the Little Grebe, while the name Didapper (a contraction of "Dive-dapper") was known to Shakspeare.

This is a very appropriate title, as diving is the chief characteristic of the bird. It pops under water as if by magic, and without the least visible exertion. Now, all of my readers who have practised the art of

diving know how difficult it is to dive from the surface, and how much exertion of the limbs is needed before the body can be forced under water. Yet the Dabchick dives so quickly that the eye cannot follow its movements. After remaining under water for a wonderfully long time, it pops up again, and in a moment is swimming about with its own peculiar jerking movements.

Some years ago a pinioned Dabchick was kept in the circular pond in "Tom Quad," of Christ Church College, Oxford. "Mercury" (as the pond is called, from a figure of Mercury that in times now long past used to decorate its centre) was edged with a stone coping, which the bird could not climb. I often used to watch its ways, as it soon became familiar with any one who was accustomed to visit it. In diving it used its wings as much as its legs, and its outstretched neck and rapidly moving wings gave it so strange an aspect under water that it could hardly be even recognised as a bird.

Like the coot, the Dabchick makes its nest at some distance from the bank. Like the water-hen, it covers the eggs when it leaves the nest. When first laid, the eggs are white, but they never retain their whiteness. Probably owing to the materials with which the bird covers the eggs they soon become stained, and in a short time look as if they had been thickly splashed with mud and blood. It is impossible to remove the stains, so that a pure white egg is very seldom secured.

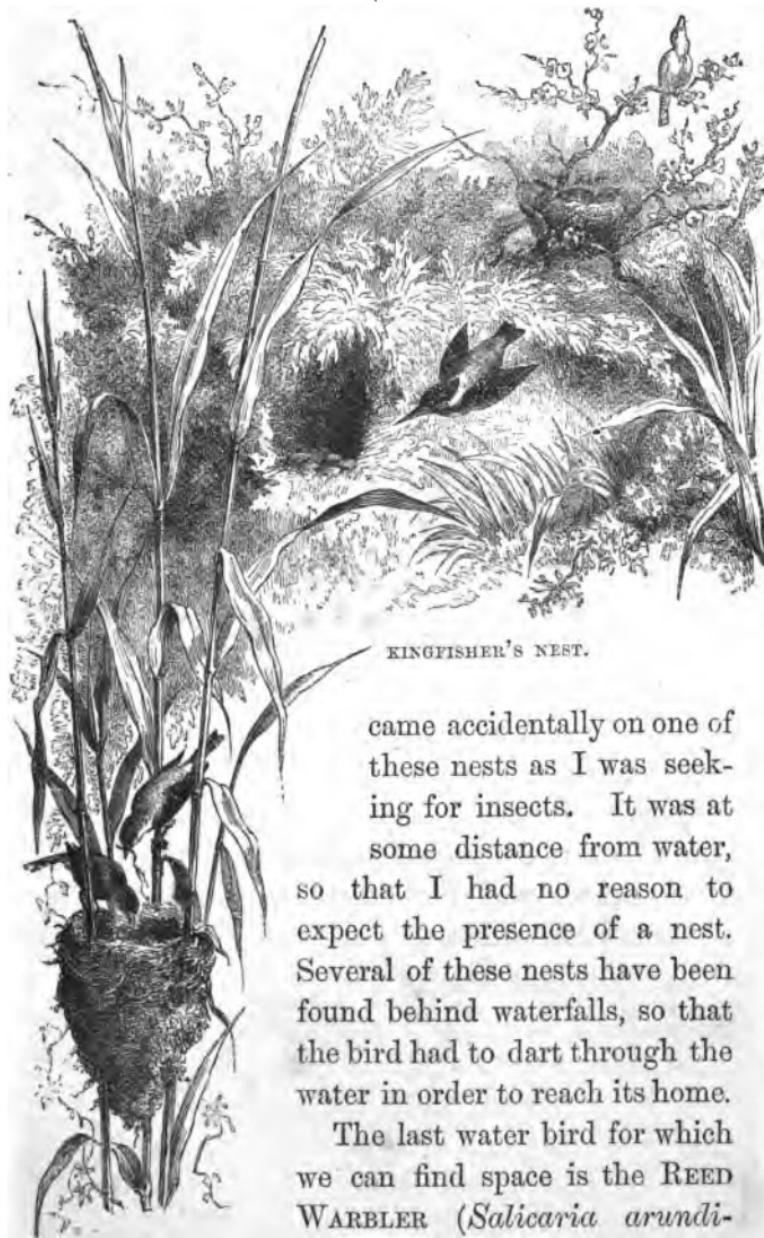
The observer should look carefully at the feet of the Dabchick. Like the Grebes in general, the three front toes are furnished with a narrow web on either side, and therefore look like three "lanceolate" leaves.

In or near shallow water, especially if it should be rapid and rippling, the interesting DIPPER (*Hydrobates cinclus*) may often be found. It is sometimes called the Water Ousel, and is notable as being a British representative of the Ant Thrushes.

Probably because it has little need of flight, the tail is so short that it really looks as if it had been artificially clipped. The Dipper is remarkable for its habit of seeking its food under water, not diving deeply like the dabchick, but haunting shallow waters, running over their stony beds, and picking up the insects and crustacea which inhabit the water. Considerable exertion is required while the bird is thus engaged, and it goes tumbling along in a most awkward-looking manner, using its wings freely in order to keep itself below the surface.

The nest of the Dipper is always placed near the water, and is so ingeniously concealed that it is mostly found by accident.

The bird selects some convenient hole in a bank near or over the water, and fills it with a nest made of moss, not unlike that of the wren. The exterior of the nest is always made of damp moss, so that it appears to be merely a lump of growing moss, and gives no sign of the nest which it conceals. I once



KINGFISHER'S NEST.

came accidentally on one of these nests as I was seeking for insects. It was at some distance from water, so that I had no reason to expect the presence of a nest. Several of these nests have been found behind waterfalls, so that the bird had to dart through the water in order to reach its home.

The last water bird for which we can find space is the REED WARBLER (*Salicaria arundinacea*).

The nest of this bird is in its way quite as worthy of notice as that of the dipper. Instead of being concealed by living moss, it is built quite open, with no attempt at concealment. Yet, owing to the locality which is chosen, the nest, though not uncommon, is seldom found except by those who go to search for it.

Choosing the middle of a clump of reeds, the bird selects three or four tall stems which grow closely together, and fastens its nest to them. In rivers, especially if they be tidal, the nest is rather more than a yard from the surface of the water. It is narrow, and very deep in proportion to its diameter, so that even if the combined influences of the wind and the stream should bow the nest to the water the eggs will not fall out.

The nest is made of grass-blades, strips of sedge, and similar materials, and is warmly lined with horse-hair and vegetable down.

If the reader can find one of these nests, I strongly advise him to keep a watch on it until the breeding season is over, and then to remove it and keep it as a token of the wonderful work which is done by some of the birds that live "By the River."



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